United States
Department of
Agriculture

Soil
Conservation
Service

A Flood Plain Management Study

For The Town Of Norwich, Vermont

Prepared in Cooperation with

- NORWICH, VERMONT PLANNING BOARD
- OTTAUQUECHEE NATURAL RESOURCES CONSERVATION DISTRICT
- VERMONT DEPARTMENT OF WATER RESOURCES

All programs of the Department of Agriculture
are available to everyone without regard to
race, creed, color, sex, or national origin.

FOREWORD

The Soil Conservation Service, U.S. Department of Agriculture, prepared the information in this flood plain management report. Officials of the Vermont Department of Water Resources, the Ottauquechee Natural Resources Conservation District, and the Town of Norwich cooperated in compiling the report.

The flood hazard and land use information should serve as a technical base for flood plain management programs. State and local governments, as well as the public, will benefit from knowledge of flood information on the Ompompanoosuc River, Connecticut River and its tributaries. A program to minimize future flood damages can be developed from this information. Describing the legal aspects and methods of conducting management programs is not within the scope of this report. However, some general recommendations are included.

We thank the many people who contributed information for the study. We also thank the landowners who gave permission for field surveys.

TABLE OF CONTENTS

893835

FLOOD PLAIN MANAGEMENT STUDY
TOWN OF NORWICH
WINDSOR COUNTY, VERMONT

The Vermont Agency of Environmental Conservation (VT-AEC), the Town of Norwich, and the Ottauquechee Natural Resources Conservation District (NRCD) coordinated in this floodplain management study and report preparation. The VT-AEC provided overall coordination for the study and assisted with the field surveys. The Town of Norwich has provided public participation, made necessary arrangements for field surveys, provided base maps, and duplicated and distributed this report. The NRCD has also cooperated in the effort.

These state and local entities requested the flood plain management study to provide detailed flood frequency characteristics and other analyses for a major portion of the flood plain system within the Town of Norwich. The town was experiencing increasing pressures for development of flood prone areas and lacked detailed flood plain information.

The U. S. Department of Agriculture, Soil Conservation Service (SCS) participated in the study and preparation of this report under the authorities of Section 6, Public Law 83-566, as amended; Executive Order 11988, Flood plain Management, dated May 24, 1977; Recommendation 3, a Uniform National Program for Flood plain Management, Water Resources Council, September 1979; and U. S. Department of Agriculture's Secretary's Memorandum Nos. 1606 and 1607, November 7, 1966.

The Vermont Department of Water Resources, a department within the VT-AEC, is responsible for making studies, policies, and plans for the use, development, and protection of Vermont's water resources under Chapter 37, Title 10, of the Vermont Statutes Annotated.

This report provides a description of the flood plain system including its natural values, flood-frequency-stage-inundation relationships, and alternatives for flood plain management consideration.

Flood runoff volumes and flow rates were developed along Bloody Brook and its tributaries using the SCS computer model described in Technical Release No. 20 (Reference No. 8). Flow-frequency values from this hydrologic model were adjusted as necessary in analyzing them along with values from similar gaged watersheds. Flood plain geometry and hydraulic characteristics were acquired by field surveys along their tributaries to the Connecticut River. Flood-frequency surfaces were computed using the adjusted flows from the hydrologic model as inputs to water surface profile development, using the Soil Conservation Service's Technical Release No. 61 (Reference No. 9). Results were checked against known high water marks at selected locations. The products of these analyses are the basis for much of the boundary elevation

and profile information contained in this report. This report's information reflects coordination with evaluations made by others along the Connecticut River and the Ompompanoosuc River.

The flood stages provided for selected storm frequencies should be considered as minimum elevations for the prescribed uses of this report. Certain indeterminate factors and conditions affecting future flood flows could cause higher flood stages than indicated. These include ice and debris, clogging of bridges and culverts, sediment, ice and debris jams along the channel and flood plain, and changes in the vegetative character of the channels and flood plain.

Study Area Description

This report provides detailed information on 4.3 miles of Bloody Brook, 0.6 miles of New Boston Brook, 2.7 miles of the Ompompanoosuc River and the confluence sections of their tributaries. In addition, flood hazard area information extracted from the detailed Hanover, New Hampshire, Flood Insurance Study Report is provided for the Town of Norwich side of the Connecticut River. The Sheet Index Map provides locations of these studied stream reaches.

Drainage areas of the streams studied are widely varied and are in square miles: New Boston Brook - 2.8, Bloody Brook - 18, Ompompanoosuc River - 136, and Connecticut River - 3300. The study area is located within hydrologic units coded 01080103040 and 01080104040.

The Town of Norwich is located at 43° - 45' North latitude and has a cool, moist climate. Average annual precipitation is 37 inches, which includes an average of 75 inches snowfall. Of this about 18 inches leaves the land as surface runoff. The mean annual temperature is 44° F with a winter minimum of 35° F and a summer maximum of 90° F.

Soils in the Town of Norwich are generally deep, sandy and gravelly complexes (Adams-Colton-Duxbury association) along the Connecticut River, with a transition to the uplands which consist mainly of shallow to moderately deep, loamy soils, such as the Tunbridge-Woodstock-Colrain association. A soil survey of Windsor County is currently in progress and is scheduled for completion in 1988. More detailed soil information may be available by contacting the Soil Conservation Service Field Office, Town Hall, Woodstock, Vermont 05091.

Natural and Beneficial Values

The flood plain study areas discussed in this report have several natural and beneficial values. Fisheries, wetlands, aquifier recharge areas, and agriculture are all beneficial natural components of the flood plain.

The subject stream segments of the Ompompanoosuc River, Bloody Brook, New Boston Brook, and the Connecticut River contain a viable fishery resource. In the cold water stream sections, rainbow and brook trout are the principal sport fishing species. The Connecticut River and its set backs are mainly a warm water fishery with species such as pickerel, walleye, largemouth bass, smallmouth bass predominating. The State of Vermont provides a fishing access at the confluence of the Connecticut and Ompompanoosuc Rivers, reflecting public interest in using these waters. There are other access areas on private property. The Atlantic salmon restoration project is not within the study area.

Endangered species have not been identified in the study area, but it is possible that species such as the Southern Bald Eagle, American Osprey, and American Peregrine Falcon are transient visitors.

There are not important deer yards identified by the State of Vermont in the study area, however, there is one just north of the mouth of the Ompompanoosuc River that is adjacent to the river flood plain.

The flood plains of the study area are generally narrow and contain relatively minor wetland areas with the exception of the confluence of the Ompompanoosuc and Connecticut Rivers and the upper most reaches of New Boston Brook. The New Boston Brook wetland area consists of shrub/scrub vegetation that is flooded at times to significant depths by beavers. The wetlands at the mouth of the Ompompanoosuc and along the Connecticut River are mostly grassy areas that are intermittently flooded with varying depths of water. Some of the Connecticut River setbacks are permanently flooded.

Wetlands within the flood plain are a valuable resource as they provide buffer areas to minimize floodwaters, areas for aquifier recharge, and valuable wildlife habitat.

Some areas of the flood plain are utilized for agriculture as pasture or hayland which is an appropriate use and has the potential to minimize flood damage by providing safe areas for flood waters. Pasture and hayfields also have value to the farms that utilize them as a forage source.

Flood Problems

The Town of Norwich has experienced severe flooding this century during March 1913, November 1927, March 1936, September 1938, June 1973 and August 1976. The November 1927 flood was the flood of record on the Connecticut River in the area (considered greater than a 100-year event) while the June 1973 flood was more severe along the tributaries. The worst of the tributary flood damages has occurred along Bloody Brook. Flood damages along the Connecticut River have been worst in the area near the confluence of the Ompompanoosuc River.

Flooding damages agricultural land; woodland; town, state and federal highways; farmsteads; 53 residences and other types of buildings. The appendix contains flood hazard area photomaps which outline the potential flood areas. Table 1 provides a further description of the flood hazard.

Figures 1 through 4 show the surface height of the 100-year flood at selected locations.

Table 1 Characteristics of Potential Flood Damages, Areas Studied in Town of Norwich, Vermont

Stream	Type of Drainage	Acres by Flood Frequency 100-Year	500-Year
Bloody Brook and New Boston Brook	Agricultural	141	148
	Woodland	7	8
	Roads, bridges and buildings	9	10
	Subtotal	157	166
Ompompanoosuc River	Agricultural	141	143
	Woodland	20	20
	Roads, bridges and buildings	17	17
	Subtotal	178	180
Connecticut River	Agricultural	280	290
	Woodland	14	14
	Roads, bridges and buildings	74	85
	Subtotal	368	389
TOTAL STUDY AREA	Agricultural	562	581
	Woodland	41	42
	Roads, bridges and buildings	100	112
	Total	703	735

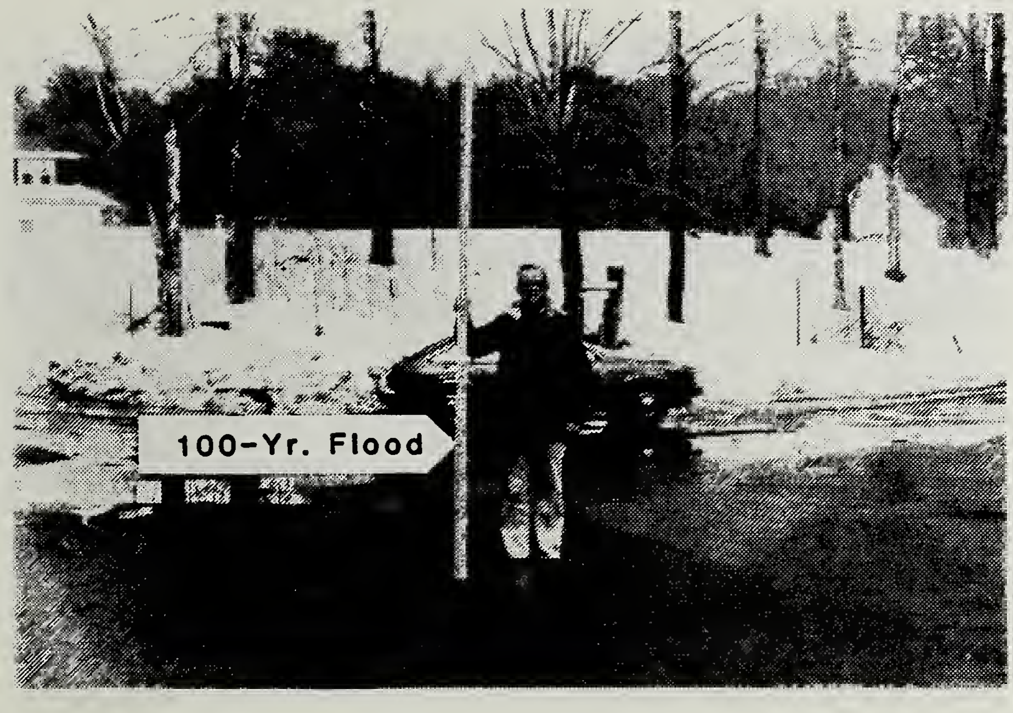


FIGURE 1

Junction of Turnpike Road and New Boston Road just North of bridge over Bloody Brook.
Cross Section BL15

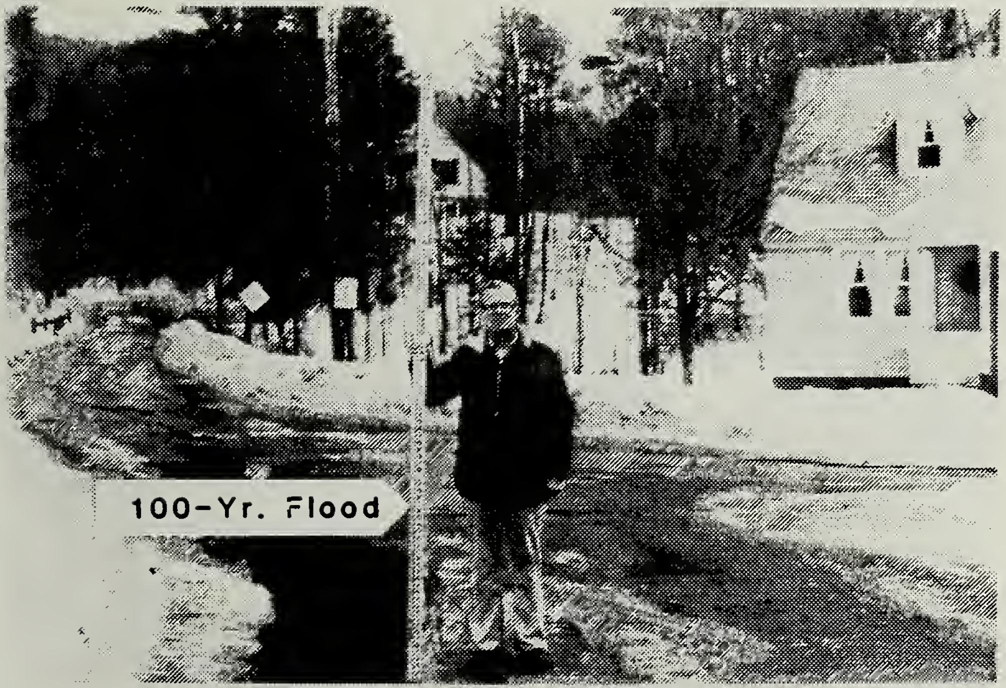


FIGURE 2

West approach to bridge over Bloody Brook on cross-road between New Boston and Beaver Meadow Roads.
Cross Section BL21

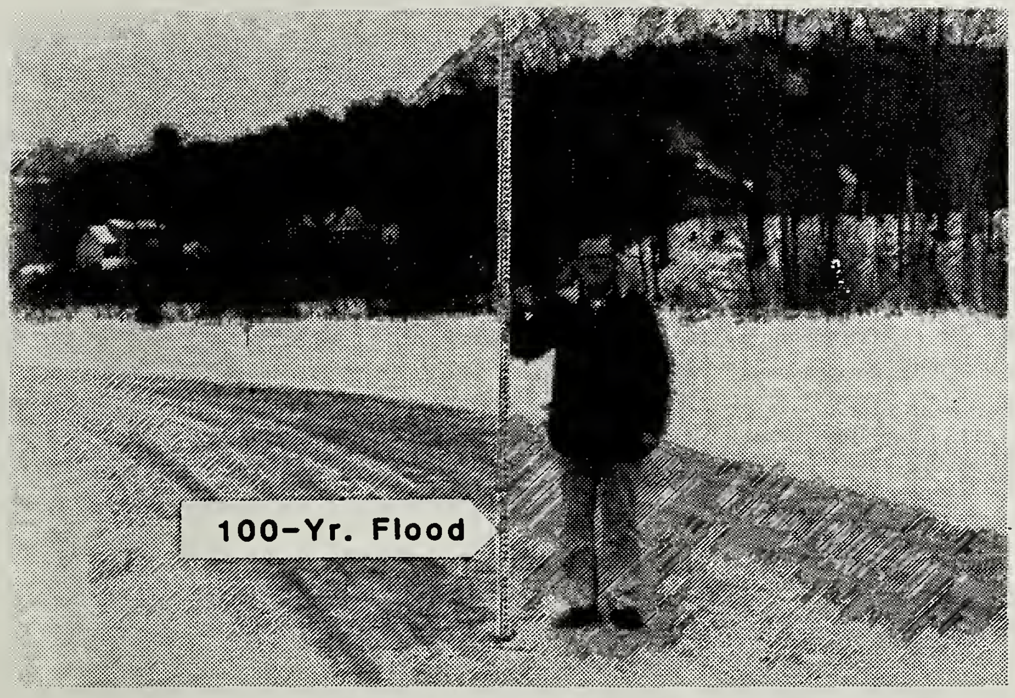


FIGURE 3 Middle of drive at entrance to the Catholic Church off Beaver Meadow Road.
Cross Section BL25

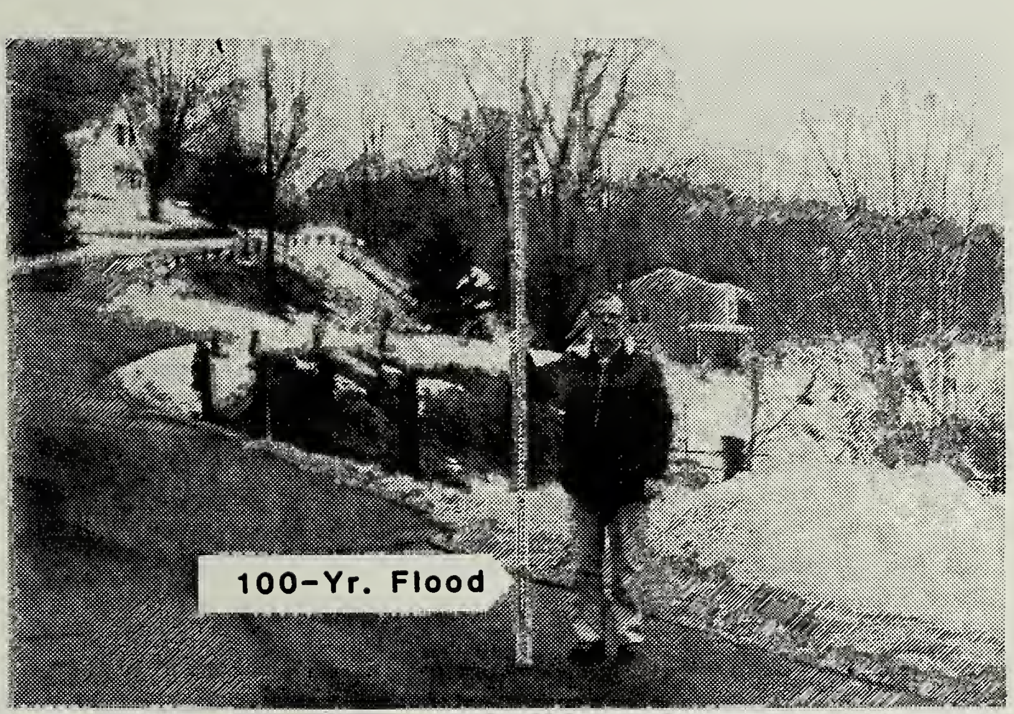


FIGURE 4 West approach to bridge over Bloody Brook on Mechanics Street.
Cross Section BL28

Depths of flow along the tributaries for the 100-year flood range from about five feet to thirteen feet. The 100-year flood velocities in the channel range from two to sixteen feet per second. These values were determined under the assumption that bridges, culverts and other flow restrictions are clear of debris.

The hydrologic conditions are expected to remain about the same for the foreseeable future. Development is occurring primarily in the lower reaches of the tributaries where effects on stream flooding are generally less. Unless managed development of the flood plain is implemented, the possibility of raised flood heights from flood plain encroachment could occur. This, as well as employment of conservation practices for protection against increasing runoff from headwater development, should be of primary concern to the townspeople in the future.

Existing Flood Plain Management

In Vermont, municipalities have the authority to regulate development in flood hazard areas under Title 24 VSA chapter 91. Title 10 VSA chapter 32 authorizes the Secretary of the Agency of Environmental Conservation to designate flood hazard areas and to assist the towns with flood hazard regulations. Title 25 VSA subsection 4409 requires towns to submit a report to Water Resources before issuing a permit for development in a designated flood hazard area.

Several other laws and regulations administered by the state contain special requirements for development in flood hazard areas. Some of these are:

Act 250 (10 VSA chapter 151) administered by the Environmental Board and District Environmental Commissions;

Health Regulations administered by the Protection Division of the Agency of Environmental Conservation;

Storage of Flammable Liquids (20 VSA section 2721) administered by the State Fire Marshall;

Stream Alteration (10 VSA chapter 28) administered by the Department of Water Resources;

Dam Construction (10 VSA chapter 29) administered by the Department of Water Resources.

The Town of Norwich has an interim flood plain zoning ordinance in effect. However, the available mapping is not adequate to properly administer the ordinance.

Alternatives for Flood Plain Management

Present Condition

Allowing the current flooding situation to continue is a possible although undesirable alternative. Essentially the flood damages enumerated in Table 1 would continue. Lack of control over development in the flood plain could result in further encroachment by development with the accompanying increases in flood damages.

Land Treatment

Inclusion of conservation practices for erosion and runoff control in new developments and building areas would help to assure protection against induced flooding from this source. Most of the development now is occurring in the lower extremities of the tributaries where control of erosion and sedimentation (to protect stream capacities) may be more important than runoff control.

Nonstructural Measures

Floodproofing of buildings and other high value property in the flood plain is a particularly appropriate measure for reducing losses to individual properties. A flood warning system or plan would be helpful along the Ompompanoosuc and Connecticut Rivers where time to respond with emergency protection activities is available. This approval would not be appropriate along Bloody Brook and its tributaries where the time to flood peak is very short (1.8 hours). Relocation of some residences and buildings or acquisition to eliminate risks may be appropriate in some instances. The Town of Norwich plans to adopt formal flood plain regulations which will be very helpful in assuring development in the future will not sustain frequent, severe flood losses. The National Flood Insurance Program has made affordable flood insurance available to flood-prone property owners through private underwriters. Owners of existing flood prone property should consider flood insurance as a means of reducing their flood loss risk. Other nonstructural approaches such as emergency preparedness and building or development codes should be considered.

Structural Measures

There appears to be little opportunity for modifying floods through headwater inpoundments (dams) or channel enlargement. Diking of clustered development such as that near the confluence of the Ompompanoosuc River with the Connecticut River is a possibility. This alternative would require intensive study to determine cost-benefit relationships.

Combinations of Alternatives

Several of the above alternatives could be combined in a number of ways to provide a plan to address the flooding problem.

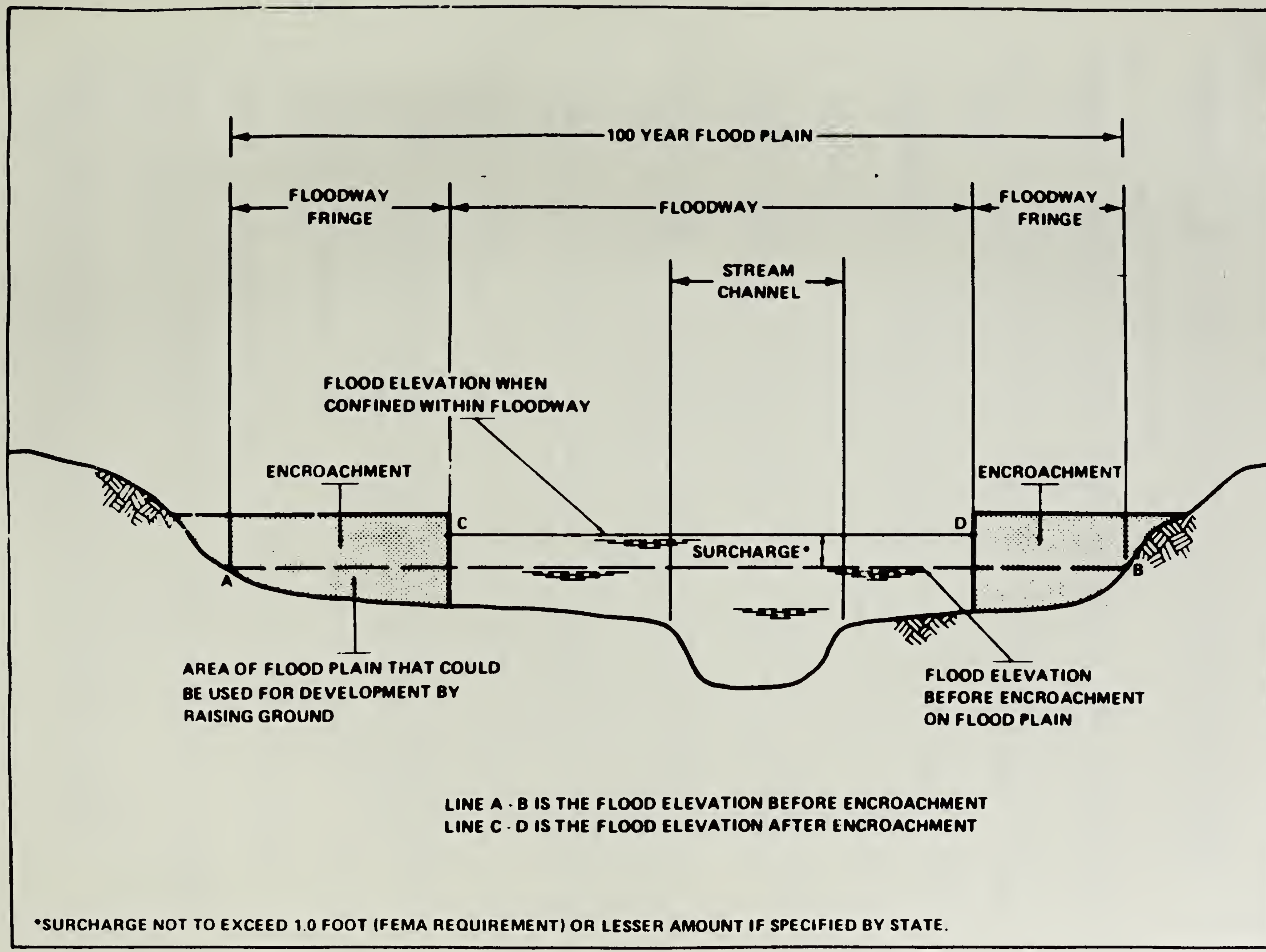
Floodway Determination

Any development activity that raises the elevation of the flood plain will restrict flow and increase flood heights. Communities have found benefits from allowing carefully controlled development to occur in the flood plain fringe provided resulting increases in flood hazard can be tolerated. The National Flood Insurance Administration uses the concept of floodway as an aid in evaluating such situations. This concept partitions the 100-year flood area into a floodway and a floodway fringe. The floodway fringe is the portion of the floodplain that can be completely obstructed without increasing the water-surface elevation of the 100-year flood more than one foot at any point. The floodway is the remaining portion of the channel and the flood plain (see Figure 5).

This theoretical floodway data has been provided the Town of Norwich on work sheets as a separate entity from this report.

Flood Hazard Maps

The photomaps entitled "Flood Hazard Areas" (sheets 1 through 11 in Appendix A) show the 100-year and 500-year flood areas. These areas are depicted based on present land use and management conditions. The flood boundaries show the approximate location on the ground for general reference purposes. The 500-year flood boundary is to be interpreted as being close to the 100-year flood boundary where it is not separately mapped. The reason for this is that the valley side slopes along many reaches of stream are steep and the map scale small. Along such reaches it is therefore not mapped. If a more precise location of a flood boundary is needed, one can reference the desired location and frequency-elevation on the flood profiles printed on the reverse side of the photomap and establish the boundary on the ground by field survey. Appendix A provides a tabulation of elevation reference marks that can be used in connection with this activity.



FLOODWAY SCHEMATIC

Figure 5

Glossary of Terms

<u>backwater</u>. High water caused by downstream obstruction or restriction, or by high stage on an intersecting stream.

<u>BM</u>. Benchmark of established elevation.

<u>bottom of culvert</u>. Elevation of the lowest flow surface of a culvert (or pipe) through which flood flows pass.

<u>cfs</u>. Cubic feet per second - a unit of discharge that is equal to the flow of one cubic foot per second past a given point.

<u>cross section</u>. Shape and dimensions of a channel and valley perpendicular to the line of flow.

<u>elev.-bridge deck</u>. Elevation of a roadway across a bridge or culvert.

<u>elev.-low chord</u>. Elevation of lowest structural "beam" that limits the height of the bridge opening; or may indicate the top of a culvert opening.

<u>elev.-low road</u>. Elevation of low point on a roadway approaching or crossing a bridge or culvert - shown only if lower than <u>elev.-bridge deck</u> at a particular road section.

<u>flood</u>. An overflow of lands not normally covered by water; a temporary increase in streamflow or stage; or the discharge causing the overflow or temporary increase.

<u>flood frequency</u>. An expression of how often a flood of given magnitude can be expected.
Examples:
<u>10-year frequency flood</u>. The flood which can be expected or exceeded on an average once in 10 years; or which would have a 10 percent chance of being equaled or exceeded in any given year.
<u>100-year frequency flood</u>. ....one percent chance....in any given year.

<u>flood peak or peak discharge</u>. Highest discharge attained during a flood.

<u>flood plain or flood-hazard area</u>. Lands adjoining a stream (or other body of water) which has been or may be covered with water.

<u>flood profile or profile</u>. A plotted or imaginary line defining the highest water surface elevations along a stream during a particular flood.

flood-hazard area. See flood plain.

flood routing. Computation of the changes in the rise and fall in streamflow as a flood moves downstream. The results provide hydrographs of discharge versus time at given points on the stream.

floodway. The portion of the stream channel and floodplain that must be kept free of encroachment to prevent flood stages more than 1 foot higher than natural conditions.

frequency-discharge curve. A plotted line showing the recurrence interval (or flood frequency) of discharges at a stream gage, surveyed cross section, or other station along stream. (Used with a stage-discharge curve to determine the high water elevations resulting from selected flood discharges at that station on the stream.)

hydrograph. A curve showing the rise and fall of flood discharge with respect to time at a specific station on the stream.

land use. Classification of type of vegetation or other surface cover conditions on a watershed - used (with a similar classification of soils) to indicate the rate and volume of flood runoff.

NGVD. National Geodetic Vertical Datum, the normal standard of elevation reference.

peak discharge or flood peak. The highest rate of runoff (discharge) attained during a flood.

profile. See flood profile.

runoff. That portion of the total storm rainfall flowing across the ground or other surface and contributing to the flood discharge.

stage-discharge curve. A plotted curve showing elevations resulting from a range of discharges at a surveyed cross section, stream gage, or other point on a stream.

top of culvert. Elevation of the uppermost flow surface of culvert (or pipe) through which flood flows pass.

TBM. Temporary benchmark.

watershed. A drainage area which collects and transmits runoff to the outlet of the drainage basin.

REFERENCES CITED

1. Topographic maps; 7.5 minute series; scale, 1:24000; U. S. Geological Survey, Washington, D. C.: Hanover, VT-NH, 1959. 15 minute series; scale, 1:62500; Mt. Cube - NH-VT, 1931, Strafford, VT 1944.

2. Water Resources Data for New Hampshire and Vermont, Water Year 1977, Report No. NH-VT-77-1, U. S. Geological Survey, Boston, MA; August 1978.

3. A Unified National Program for Flood Plain Management, U. S. Water Resources Council, Washington, D. C., September 1979.

4. Regulation of Flood Hazard Areas to Reduce Flood Losses, (two volumes), U. S. Water Resources Council, Washington, D. C., 1971 and 1972.

5. Flood Plain Management Handbook, U. S. Water Resources Council, Washington, D. C.; September 1981.

6. Guide for Flood and Flash Flood Preparedness Planning, U. S. Department of Commerce, National Weather Service, Silver Spring, MD, February 1977.

7. Flood Flow Frequency, Bulletin 17B, U. S. Water Resources Council, Washington, D. C., September 1981.

8. Computer Program for Project Formulation, Hydrology, Soil Conservation Service Technical Release No. 20, May 1965.

9. WSP2 Computer Program, Soil Conservation Service Technical Release No. 61, May 1976.

10. Floodway Determination Computer Program, Soil Conservation Service Technical Release No. 64, June 1978.

11. Unpublished data, flood profiles on the Connecticut River, U.S. Army Corps of Engineers, New England Division.

12. National Engineering Handbook, Section 4, Hydrology; U. S. Department of Agriculture, Soil Conservation Service; Washington, DC; November 1954, Revised August 1980.

13. Connecticut River Basin, Master Water Control Manual; U. S. Army Corps of Engineers, New England Division; November 1983.

14. Flood Insurance Study, Town of Hanover, New Hampshire; U. S. Department of Housing and Urban Development, Federal Insurance Administration; Boston, MA; January 1978.

15. Flood Plain Information, Connecticut-White-Mascoma Rivers; U. S. Army Corps of Engineers, New England Division; Waltham, MA; May 1972.

USE OF APPENDIX

This appendix provides the data needed to use this report.

The Flood Plain Area Photomaps can be used for decisions where precise elevations are not required; for example, a brief check of the appropriate photomap may indicate that a proposed building site is obviously in or out of the flood plain.

On the reverse of each photomap are flood profiles, water surface elevation tabulations, and benchmark data. These can be used with the photomaps to determine flood elevations at any point along the streams in the study area as follows:

1. On the appropriate photomap find the point on the stream where the proposed building is to be located; then scale the distance along the stream to the nearest cross section.

2. On the appropriate flood profile sheet, scale the distance determined in Step 1 from the cross section back to the original stream location, and read the elevation of the desired flood frequency line.

3. Transfer the elevation determined in Step 2 to the ground from the nearest established benchmark.

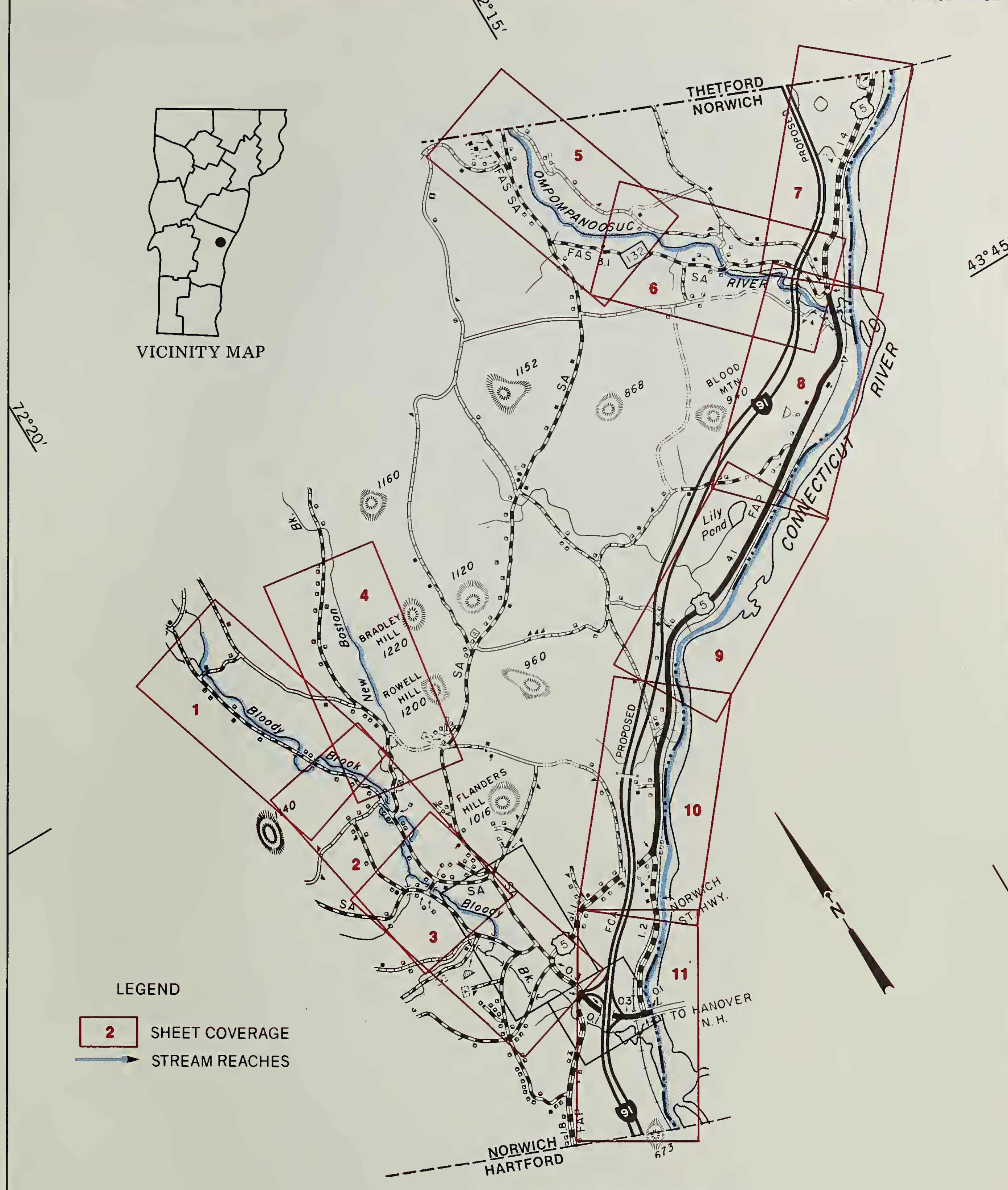
   If the point on the ground is at one of the surveyed cross sections, the elevation can be read directly from the tabulation of water surface elevations.

Investigations and analysis are described.

Steps that can be taken by individuals during a flood are described.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



SHEET INDEX MAP

FOR THE

NORWICH FLOOD PLAIN MANAGEMENT STUDY

BLOODY BROOK, OMPOMPANOOSUC AND CONNECTICUT RIVERS

ORANGE AND WINDSOR COUNTIES, VT

SCALE	0	1		2 MILES
	0	1	2	3 KILOMETERS

Base Source:
Windsor County General Highway Map prepared by Department of Highways, Highway Planning Division, Vermont Polyconic Map Projection based on U.S. Geological Survey Maps.

USDA-SCS FORT WORTH, TEXAS 1985

100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

FEBRUARY 1985 4-R-39069

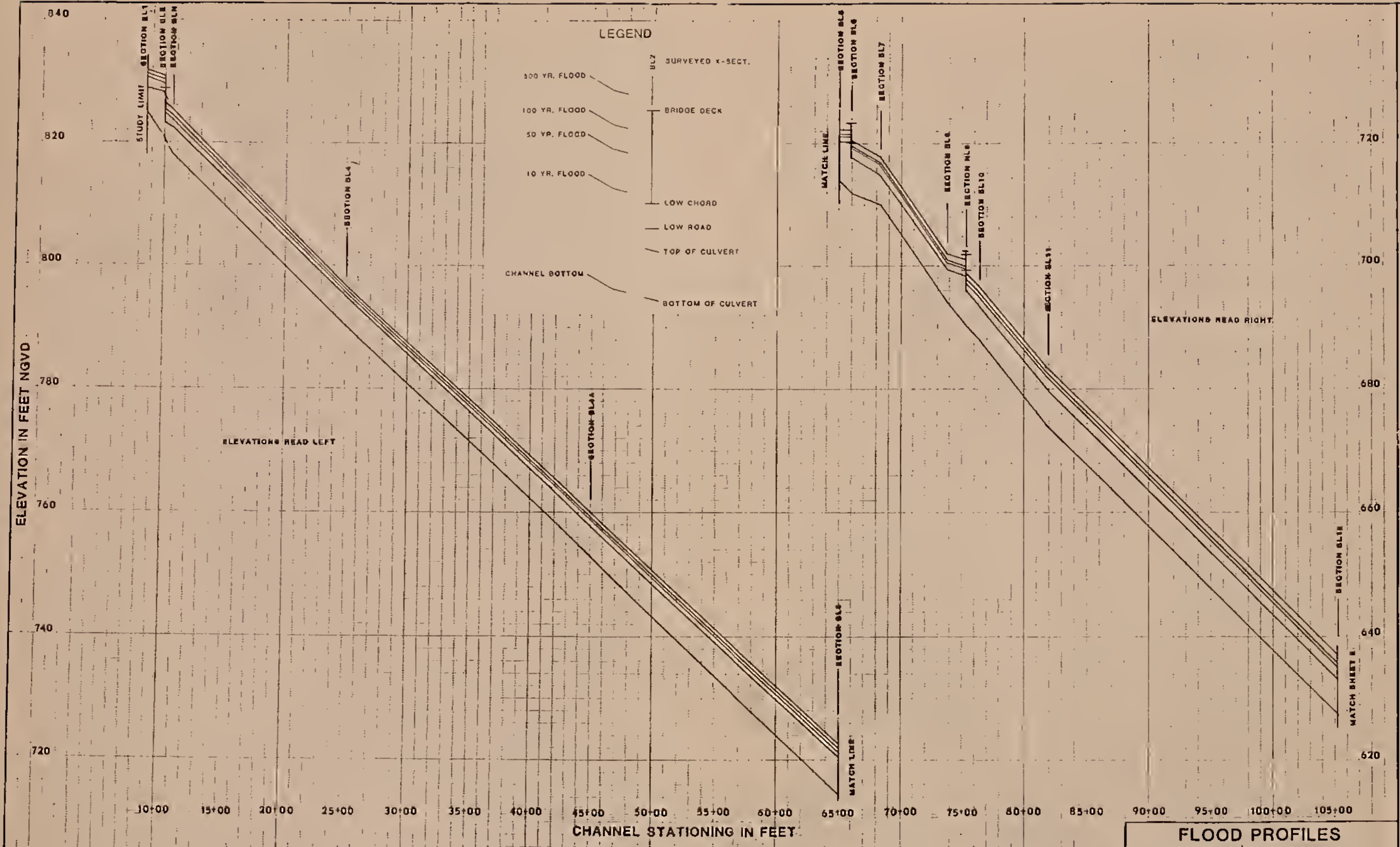
SHEET 1 OF 11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

BLOODY BROOK



FLOOD PROFILES

BLOODY BROOK

NORWICH, VERMONT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

M.O.

1

TABULATIONS OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurence of once in:	
Stream	Cross Section	100 years (National Geodetic Vertical Datum of 1929)	500 years
Bloody Brook	BL1	831.0	831.6
	BL2	830.2	830.6
	BL3	824.4	825.5
	BL4	795.8	796.2
	BL4A	759.1	759.7
	BL5	721.7	722.7
	BL6	721.3	722.3
	BL7	717.0	717.9
	BL8	701.1	702.0
	BL9	699.8	700.9
	BL10	695.7	696.7
	BL11	682.2	683.5

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM B-3	Approximately 0.6 mile north of BM 622, on Turnpike Road, on the southwest abutment of the concrete bridge, a chiseled square. Elevation 701.51
SCS-TBM B-4	Approximately 1.8 miles north of BM 622, on Turnpike Road, on the southeast abutment of the concrete bridge over Bloody Brook, a chiseled square. Elevation 722.43
SCS-TBM B-5	Approximately 1.1 miles north of BM 622, on the top of a concrete headwall for a 24 inch culvert under Turnpike Road, a chiseled square. Elevation 757.90
SCS-TBM B-6	Approximately 1.5 miles north of BM 622, on the stone headwall for the culvert under Turnpike Road, a chiseled square. Elevation 814.38
SCS-TBM 7	Approximately 1.7 miles north of BM 622, on Turnpike Road, on the upstream cement headwall of the 12 foot culvert for Bloody Brook, a chiseled square. Elevation 830.32

USERS GUIDE

The charts and tables contained on this sheet together with the photo base map on the reverse side, are intended to supply planners and landowners with the data necessary to plan the best use of the lands along the reach of stream depicted.

The photomap on the reverse side shows the 100 and 500-year flood boundaries along the stream reach. The location of U.S. Geological Survey Bench Marks and SCS temporary bench marks are also depicted to aid the user in establishing reference elevations.

The table of elevation reference marks on this side of the sheet gives a more detailed description of the bench mark locations together with a reference elevation in feet above mean sea level.

The tabulation of water surface elevations above lists the elevations of the 100-year and 500-year flood waters at the cross section locations which are depicted on the reverse side photomap. The 100-year storm is the reference storm used for setting actuary rates for flood insurance policies and the 500-year is generally considered the most extreme possible storm.

The channel and flood water profile above provides a more detailed picture of flood elevations along the reach of stream depicted on the photomap. It delineates the 10, 50, 100, and 500-year storm flood elevations along the entire reach and can be used to determine the water surface elevation that can be expected to occur at any specific point along the reach. This can be accomplished by locating the point of interest on the photomap, measuring the distance along the stream from a cross section, and then reading the desired flood water elevation from the profile at the same distance upstream or downstream of the cross section location.

100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 — 0 — 500 FEET
100 — 0 — 100 — 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

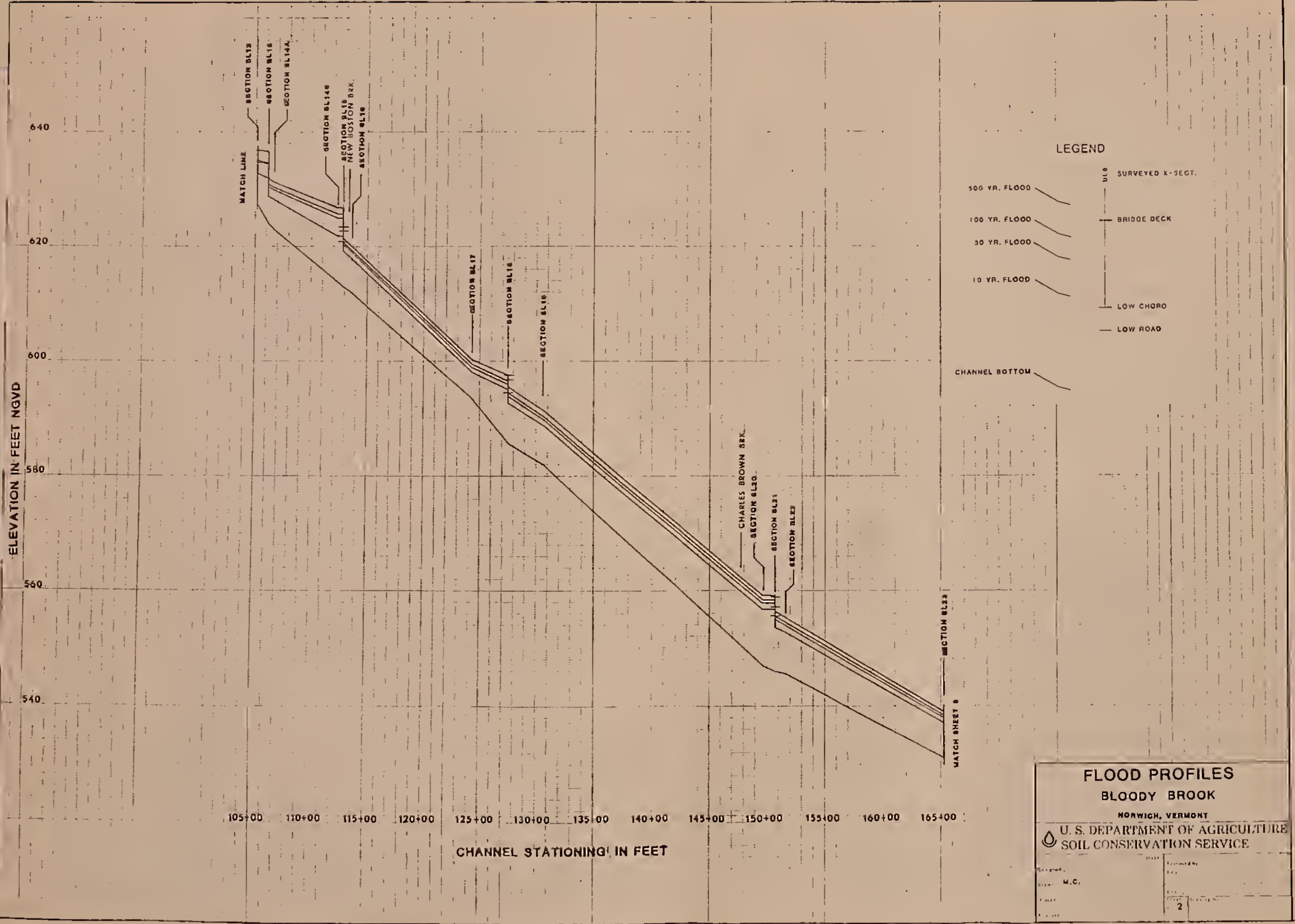
FLOOD HAZARD AREA

BLOODY BROOK

SHEET 2 OF 11

FEBRUARY 1985 4-R-39069

USDA-SCS-FORT WORTH, TEXAS 1985



TABULATION OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurrence of once in:	
Stream	Cross Section	100 years	500 years
		(National Geodetic Vertical Datum of 1929)	
Bloody Brook	BL12	[illegible]	636.7
	BL13	[illegible]	636.4
	BL14	[illegible]	[illegible]
	BL14B	625.4	626.6
	BL15	625.4	626.5
	BL16	619.1	619.7
	BL17	599.3	600.1
	BL18	596.6	597.8
	BL19	590.2	591.2
	BL20	558.2	559.0
	BL21	558.2	559.1
	BL22	554.2	555.0

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM B-1	Approximately 0.1 mile north of BM 622, on Turnpike Road, on the southeast abutment of the concrete bridge over Bloody Brook, a chiseled square. Elevation 634.21
SCS-TBM B-2	Approximately 0.25 mile north of BM 622, on the stone headwall for the culvert under Turnpike Road, a chiseled square. Elevation 652.43
USGS-BM 622	Approximately 1.3 miles north of Norwich, on New Boston Road, on the southeast abutment of the bridge over Bloody Brook, just upstream from the confluence with New Boston Brook, a chiseled square. Elevation 622.36
SCS-TBM 10	At the crossroad between New Boston Road and Beaver Meadow Road approximately 0.9 mile north of the Aldrich house, on the southeast abutment of the bridge over Bloody Brook, a chiseled square. Elevation 558.51
SCS-TBM 11	Approximately 1.3 miles north of the Aldrich house, on New Boston Road, on the southwest abutment of the bridge over Bloody Brook, a chiseled square. Elevation 597.05

USERS GUIDE

The charts and tables contained on this sheet together with the photo base map on the reverse side, are intended to supply planners and landowners with the data necessary to plan the best use of the lands along the reach of stream depicted.

The photomap on the reverse side shows the 100 and 500-year flood boundaries along the stream reach. The location of U.S. Geological Survey Bench Marks and SCS temporary bench marks are also depicted to aid the user in establishing reference elevations.

The table of elevation reference marks on this side of the sheet gives a more detailed description of the bench mark locations together with a reference elevation in feet above mean sea level.

The tabulation of water surface elevations above lists the elevations of the 100-year and 500-year flood waters at the cross section locations which are depicted on the reverse side photomap. The 100-year storm is the reference storm used for setting actuary rates for flood insurance policies and the 500-year is generally considered the most extreme possible storm.

The channel and flood water profile above provides a more detailed picture of flood elevations along the reach of stream depicted on the photomap. It delineates the 10, 50, 100, and 500-year storm flood elevations along the entire reach and can be used to determine the water surface elevation that can be expected to occur at any specific point along the reach. This can be accomplished by locating the point of interest on the photomap, measuring the distance along the stream from a cross section, and then reading the desired flood water elevation from the profile at the same distance upstream or downstream of the cross section location.

USDA-SCS FORT WORTH, TEXAS 1985

100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

FEBRUARY 1985 4-R-39069

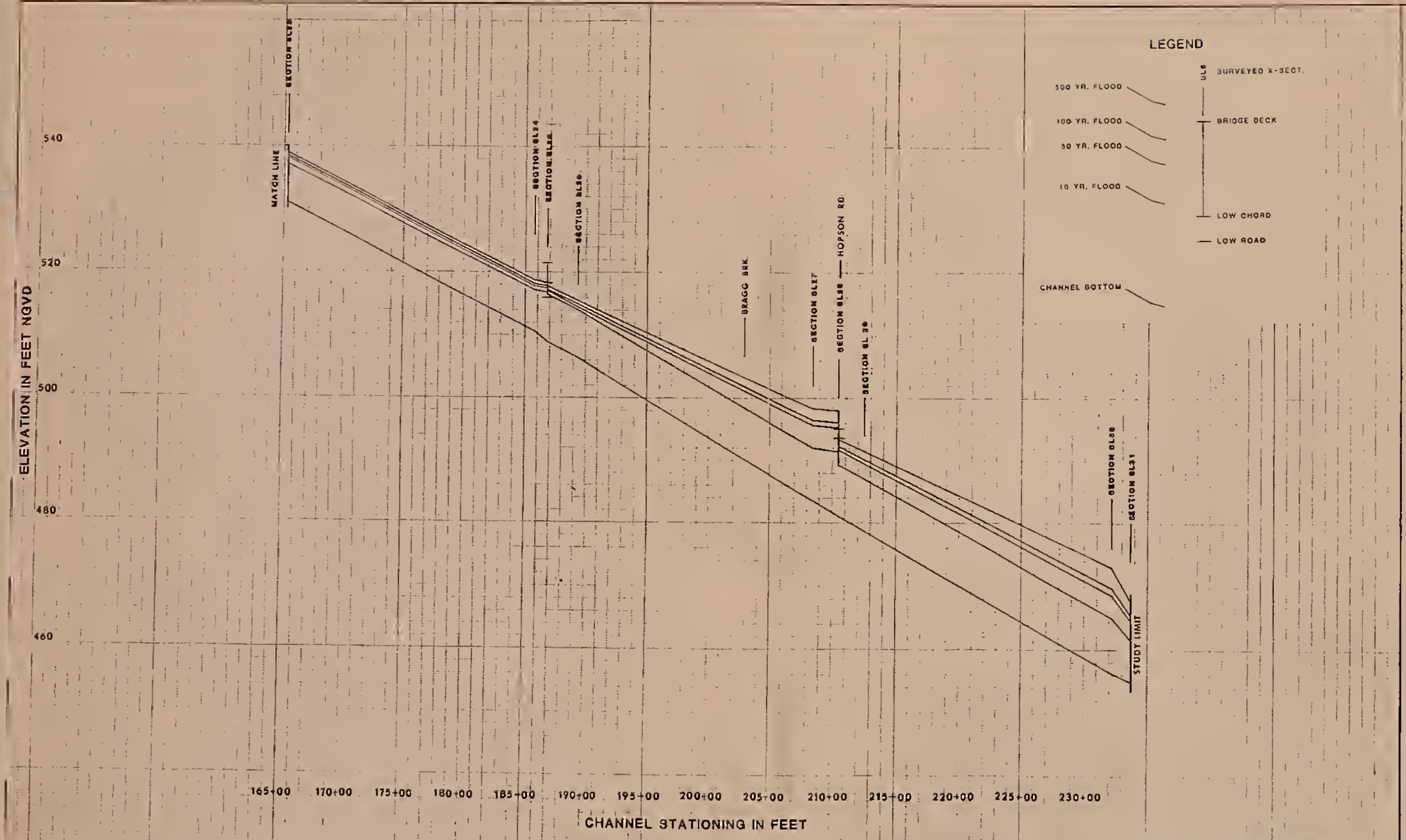
SHEET 3 OF 11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

BLOODY BROOK



FLOOD PROFILES
BLOODY BROOK
NORWICH, VERMONT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

M.C.

3

TABULATION OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurrence of once in:	
Stream	Cross Section	100 years (National Geodetic Vertical Datum of 1929)	500 years
Bloody Brook	BL23	538.2	538.7
	BL24	518.0	518.4
	BL25	517.7	518.2
	BL26	515.0	515.5
	BL27	496.3	498.1
	BL28	496.0	497.9
	BL29	490.0	491.2
	BL30	469.8	472.9
	BL31	465.1	467.4

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
USGS-BM 536	U.S. Geological disc on the side of the Aldrich house in Norwich, VT. Elevation 536.61
SCS-TBM B-8	Approximately 0.25 mile west of the Aldrich house, on Beaver Meadow Road, on the southeast abutment of the bridge over Bloody Brook, a chiseled square. Elevation 520.99
SCS-TBM B-9	Approximately 0.6 mile north of the Aldrich house, on Beaver Meadow Road, at the high point on a ledge outcrop, a chiseled and painted mark. Elevation 552.41
SCS-TBM B-12	Approximately 0.3 mile west of the Aldrich house, on Hopson Road, on the southwest abutment of the bridge over Bloody Brook, a chiseled square. Elevation 494.79
SCS-TBM B-13	Approximately 0.4 mile south and west of the Aldrich house, on Elm Street, on the southeast abutment of the concrete and steel bridge over Bloody Brook, a chiseled square. Elevation 481.69

USERS GUIDE

The charts and tables contained on this sheet together with the photo base map on the reverse side, are intended to supply planners and landowners with the data necessary to plan the best use of the lands along the reach of stream depicted.

The photomap on the reverse side shows the 100 and 500-year flood boundaries along the stream reach. The location of U.S. Geological Survey Bench Marks and SCS temporary bench marks are also depicted to aid the user in establishing reference elevations.

The table of elevation reference marks on this side of the sheet gives a more detailed description of the bench mark locations together with a reference elevation in feet above mean sea level.

The tabulation of water surface elevations above lists the elevations of the 100-year and 500-year flood storm at the cross section locations which are depicted on the reverse side photomap. The 100-year storm is the reference storm used for setting actuary rates for flood insurance policies and the 500-year is generally considered the most extreme possible storm.

The channel and flood water profile above provides a more detailed picture of flood elevations along the reach of stream depicted on the photomap. It delineates the 10, 50, 100, and 500-year storm flood elevations along the entire reach and can be used to determine the water surface elevation that can be expected to occur at any specific point along the reach. This can be accomplished by locating the point of interest on the photomap, measuring the distance along the stream from a cross section, and then reading the desired flood water elevation from the profile at the same distance upstream or downstream of the cross section location.

USDA-SCS-FORT WORTH, TEXAS 1985

- 100 Year Flood Area
- 500 Year Flood Area
- Surveyed Cross Section
- Stream Channel

BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

FEBRUARY 1985 4-R-39069

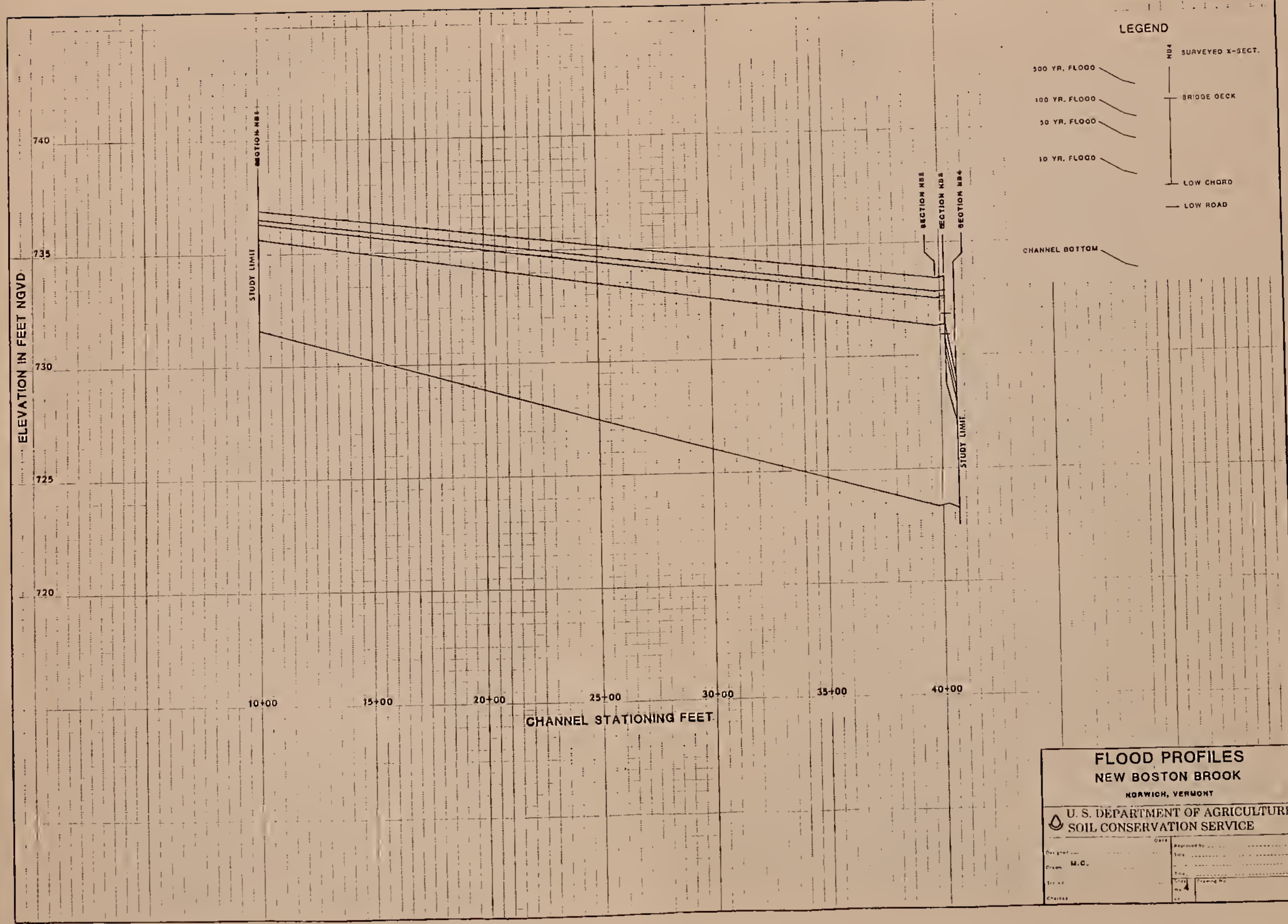
SHEET 4 OF 11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

NEW BOSTON BROOK



FLOOD PROFILES
NEW BOSTON BROOK
NORWICH, VERMONT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Drawn M.C.

TABULATIONS OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurence of once in:	
Stream	Cross Section	100 years (National Geodetic Vertical Datum of 1929)	500 years
New Boston Brook	NB1	736.5	736.9
	NB2	732.8	733.4
	NB3	732.8	733.4
	NB4	728.4	729.0

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
USGS-BM JB-4	U.S. Geological Survey disc, approximately 1.0 mile north from intersection of New Boston Road and Turnpike Road, on New Boston Road. Elevation 812.21
SCS-TBM NB-1	Approximately 1.2 miles north of the intersection of Turnpike Road and New Boston Road; and 0.2 mile north of BM JB-4 on the east side of New Boston Road; a railroad spike in the bottom of a 12" ash tree. Elevation 851.27
SCS-TBM NB-2	Approximately 0.6 mile north of BM 622, on New Boston Road, on upstream abutment of bridge over New Boston Brook, a chiseled square. Elevation 729.95

USERS GUIDE

The charts and tables contained on this sheet together with the photo base map on the reverse side, are intended to supply planners and landowners with the data necessary to plan the best use of the lands along the reach of stream depicted.

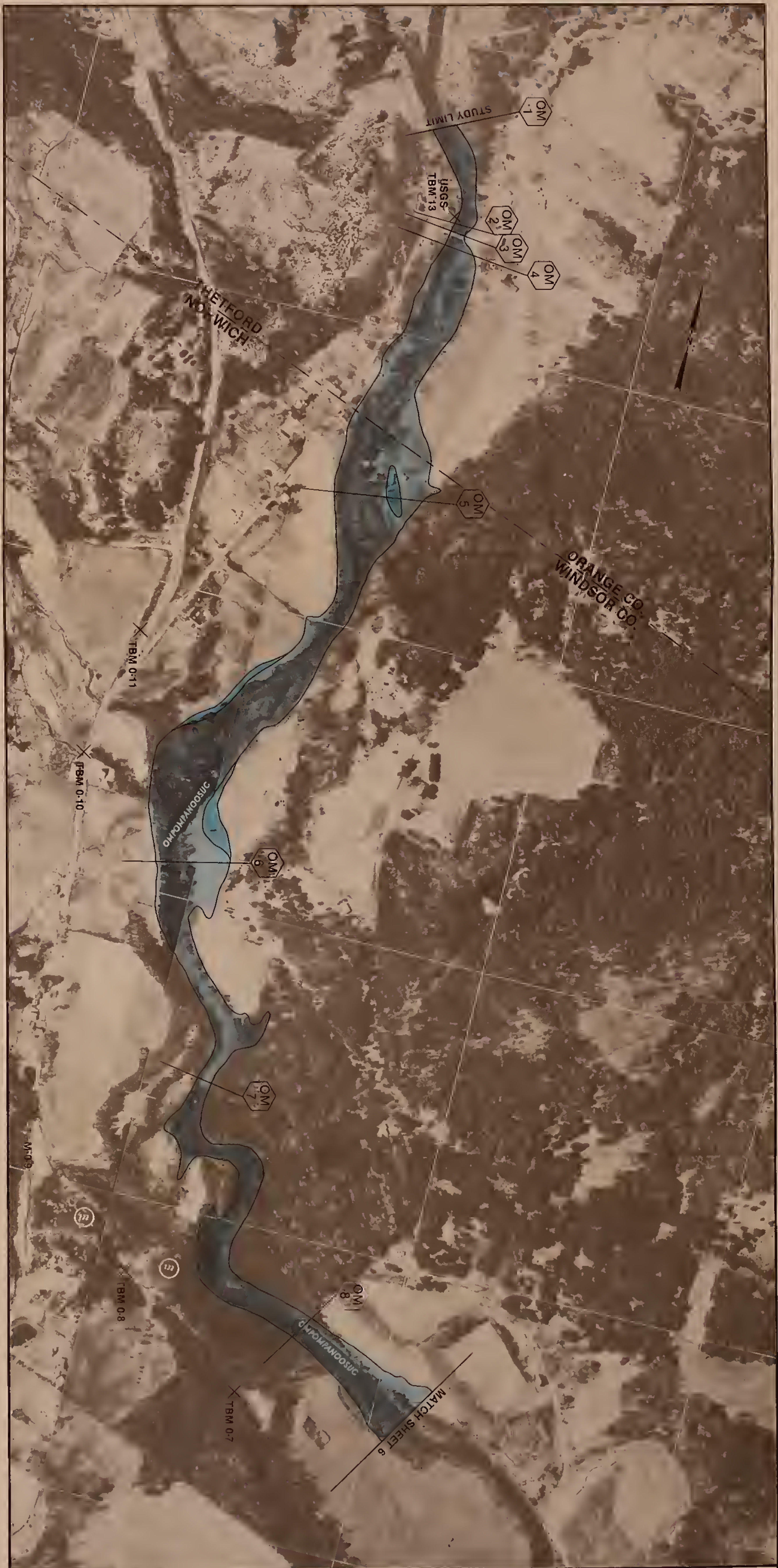
The photomap on the reverse side shows the 100 and 500-year flood boundaries along the stream reach. The location of U.S. Geological Survey Bench Marks and SCS temporary bench marks are also depicted to aid the user in establishing reference elevations.

The table of elevation reference marks on this side of the sheet gives a more detailed description of the bench mark locations together with a reference elevation in feet above mean sea level.

The tabulation of water surface elevations above lists the elevations of the 100-year and 500-year flood waters at the cross section locations which are depicted on the reverse side photomap. The 100-year storm is the reference storm used for setting actuary rates for flood insurance policies and the 500-year is generally considered the most extreme possible storm.

The channel and flood water profile above provides a more detailed picture of flood elevations along the reach of stream depicted on the photomap. It delineates the 10, 50, 100, and 500-year storm flood elevations along the entire reach and can be used to determine the water surface elevation that can be expected to occur at any specific point along the reach. This can be accomplished by locating the point of interest on the photomap, measuring the distance along the stream from a cross section, and then reading the desired flood water elevation from the profile at the same distance upstream or downstream of the cross section location.

USDA-SCS-FORT WORTH, TEXAS 1985



100 Year Flood Area
500 Year Flood Area
KE 8 — Surveyed Cross Section
→ Stream Channel

× BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

FEBRUARY 1985 4-R-39069

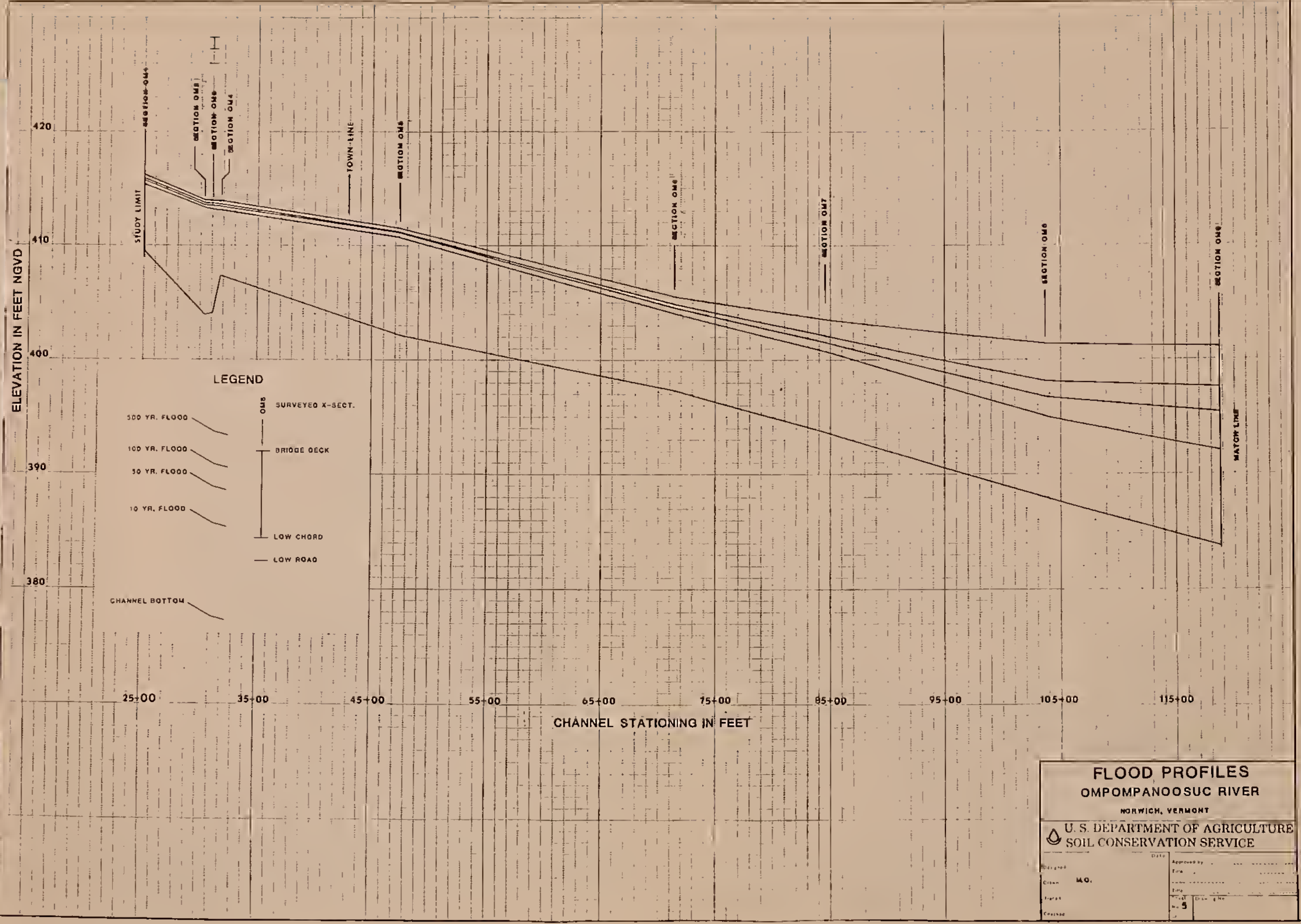
SHEET 5 OF 11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

OMPOMPANOOSUC RIVER



FLOOD PROFILES
OMPOMPANOOSUC RIVER
NORWICH, VERMONT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Drawn M.O.

5

TABULATIONS OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurence of once in:	
Stream	Cross Section	100 years (National Geodetic Vertical Datum of 1929)	500 years
Ompompanoosuc River	OM1	415.8	416.1
	OM2	413.6	413.9
	OM3	413.5	413.7
	OM4	413.4	413.7
	OM5	411.1	411.4
	OM6	404.8	405.5
	OM7	402.1	403.5
	OM8	398.3	401.3

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM O-7	On Route 132 at mile marker 1320-1411-0100, on south side of road, on the southeast corner, a chiseled square. Elevation 473.62
SCS-TBM O-8	On Route 132 150 feet east of MM 1320-1411-0080 in a 24 inch gnarled yellow birch tree, on the south side of the road, a railroad spike. Elevation 476.31
SCS-TBM O-9	Approximately 1.0 mile south of covered bridge in Union Village, on west side of Route 132, and 200 feet north of intersection of road to Norwich, on center of headwall of culvert, a chiseled square. Elevation 477.13
SCS-TBM O-10	Approximately 0.6 mile south of covered bridge on the west side of Route 132, opposite Tel. Pole #87, a nail in a 3.5 foot elm tree. Elevation 466.43
SCS-TBM O-11	Approximately 0.5 mile south of covered bridge on west side of Route 132, west of grass triangle at intersection of Union Village Road, on top of north wall of drop inlet, a chiseled square. Elevation 440.67
USGS-TBM 13	100 feet upstream from covered bridge at Union Village and 17.5 feet from corner building, a U.S. Geological Survey Marker in a 9 inch square concrete post. Elevation 417.56

USERS GUIDE

The charts and tables contained on this sheet together with the photo base map on the reverse side, are intended to supply planners and landowners with the data necessary to plan the best use of the lands along the reach of stream depicted.

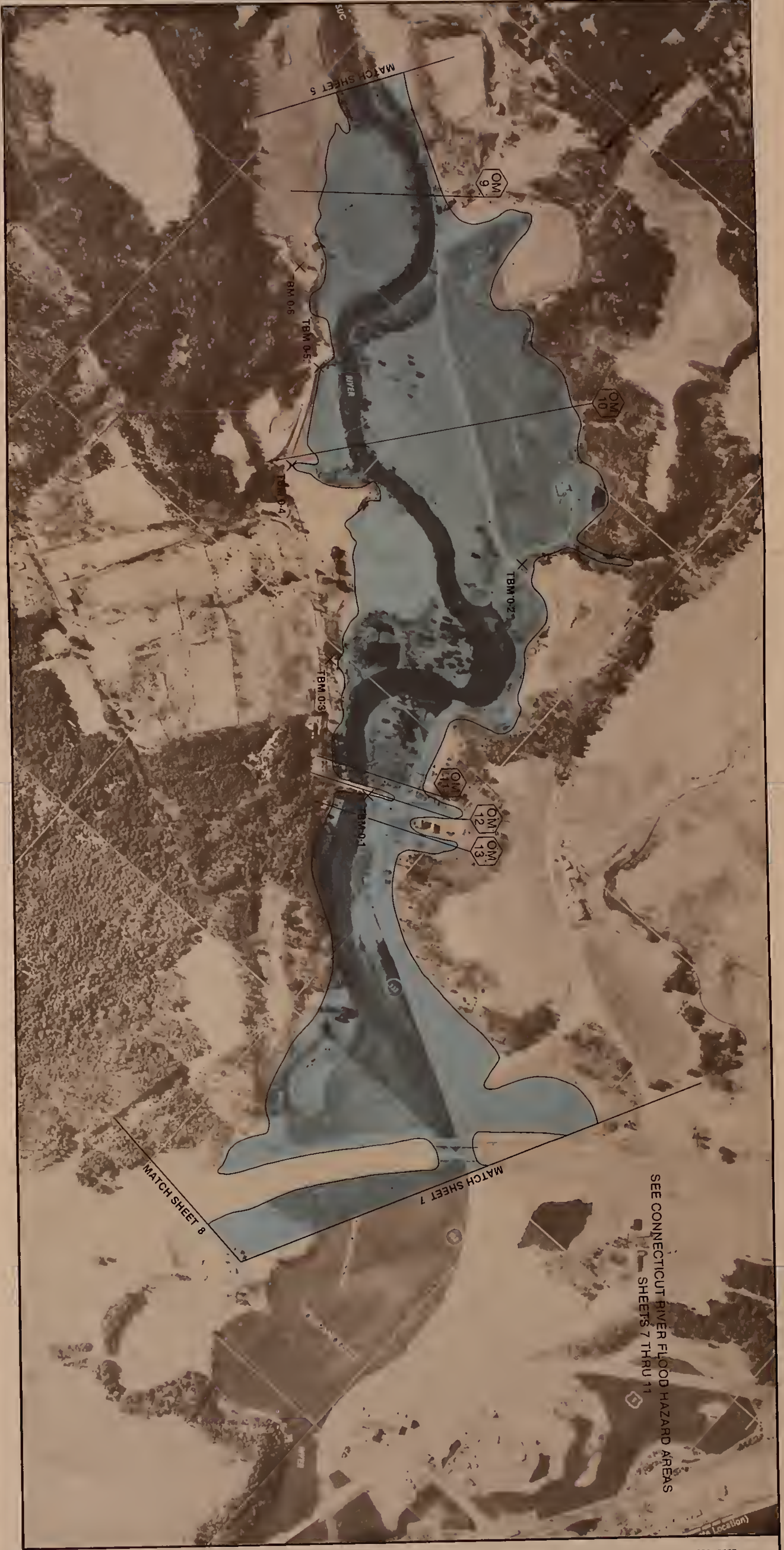
The photomap on the reverse side shows the 100 and 500-year flood boundaries along the stream reach. The location of U.S. Geological Survey Bench Marks and SCS temporary bench marks are also depicted to aid the user in establishing reference elevations.

The table of elevation reference marks on this side of the sheet gives a more detailed description of the bench mark locations together with a reference elevation in feet above mean sea level.

The tabulation of water surface elevations above lists the elevations of the 100-year and 500-year flood waters at the cross section locations which are depicted on the reverse side photomap. The 100-year storm is the reference storm used for setting actuary rates for flood insurance policies and the 500-year is generally considered the most extreme possible storm.

The channel and flood water profile above provides a more detailed picture of flood elevations along the reach of stream depicted on the photomap. It delineates the 10, 50, 100, and 500-year storm flood elevations along the entire reach and can be used to determine the water surface elevation that can be expected to occur at any specific point along the reach. This can be accomplished by locating the point of interest on the photomap, measuring the distance along the stream from a cross section, and then reading the desired flood water elevation from the profile at the same distance upstream or downstream of the cross section location.

USDA SCS FORT WORTH, TEXAS 1985



100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

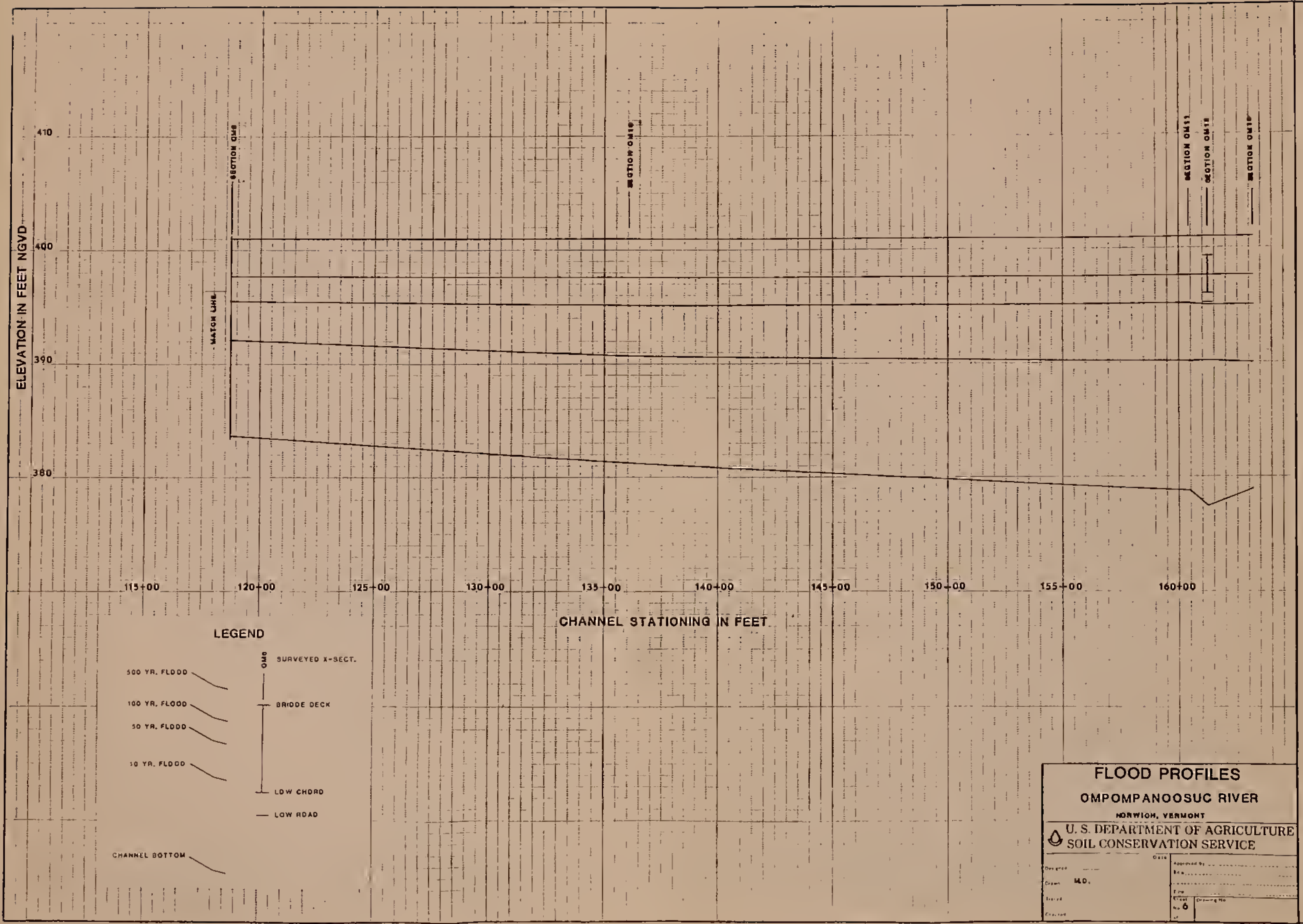
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

OMPOMPANOOSUC RIVER

FEBRUARY 1985 4-R-39069



TABULATIONS OF WATER SURFACE ELEVATIONS

Location: Stream	Cross Section	Estimated elevation of floods with frequency of occurence of once in: 100 years (National Geodetic Vertical Datum of 1929)	500 years (National Geodetic Vertical Datum of 1929)
Ompompanoosuc River	OM9	397.6	401.1
	OM10	397.6	401.0
	OM11	397.5	401.0
	OM12	397.5	401.0
	OM13	397.5	401.0

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM O-1	On Route 132, 0.9 mile west of Pompanoosuc Railroad Station, on the southeast wingwall of the bridge over the Ompompanoosuc River, a chiseled square. Elevation 399.08
SCS-TBM O-2	Approximately 0.4 mile north of TBM O-1, on a gravel road along the north side of the Ompompanoosuc River, on the east wall of a culvert a chiseled square. Elevation 390.94
SCS-TBM O-3	Approximately 0.2 mile west of TBM O-1, on the north side of Route 132, between CMP poles 43 and 44 an SCS aluminum disk and nail in a 30 inch white pine. Elevation 415.96
SCS-TBM O-4	On Route 132, 0.4 mile TBM O-1 on northeast concrete headwall, a chiseled square. Elevation 403.79
SCS-TBM O-5	On Route 132, 0.5 miles from TBM O-1, near mile marker 1320-1411-0140 in Green Mountain Power Company pole 61 a spike in a bottle cap. Elevation 408.55
SCS-TBM O-6	On the north side of Route 132, 0.6 mile west of TBM O-1, near an old barn, an SCS aluminum disk and nail in a large elm. Elevation 418.52

USERS GUIDE

The charts and tables contained on this sheet together with the photo base map on the reverse side, are intended to supply planners and landowners with the data necessary to plan the best use of the lands along the reach of stream depicted.

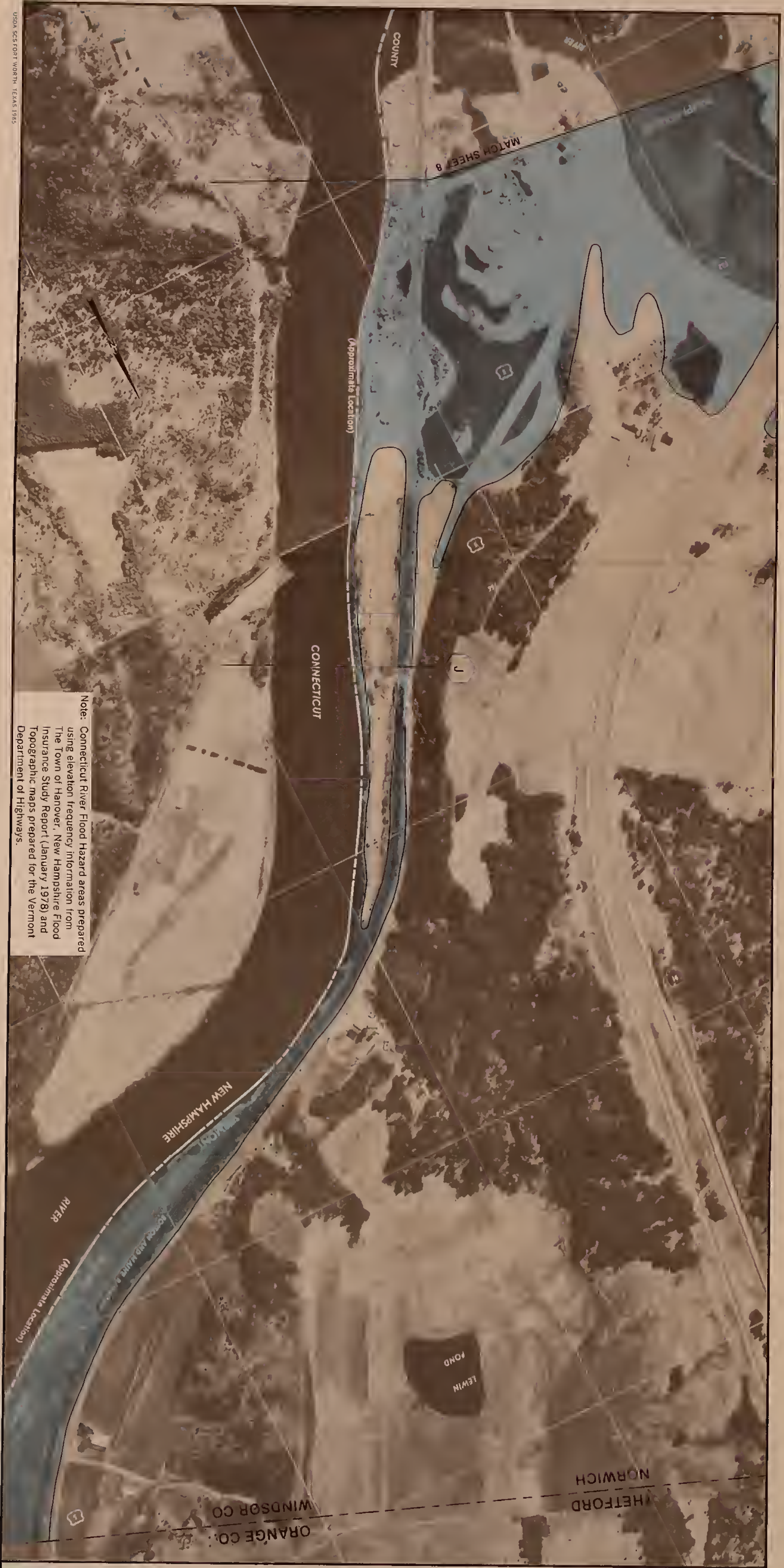
The photomap on the reverse side shows the 100 and 500-year flood boundaries along the stream reach. The location of U.S. Geological Survey Bench Marks and SCS temporary bench marks are also depicted to aid the user in establishing reference elevations.

The table of elevation reference marks on this side of the sheet gives a more detailed description of the bench mark locations together with a reference elevation in feet above mean sea level.

The tabulation of water surface elevations above lists the elevations of the 100-year and 500-year flood waters at the cross section locations which are depicted on the reverse side photomap. The 100-year storm is the reference storm used for setting actuary rates for flood insurance policies and the 500-year is generally considered the most extreme possible storm.

The channel and flood water profile above provides a more detailed picture of flood elevations along the reach of stream depicted on the photomap. It delineates the 10, 50, 100, and 500-year storm flood elevations along the entire reach and can be used to determine the water surface elevation that can be expected to occur at any specific point along the reach. This can be accomplished by locating the point of interest on the photomap, measuring the distance along the stream from a cross section, and then reading the desired flood water elevation from the profile at the same distance upstream or downstream of the cross section location.

USDA SCS FORT WORTH, TEXAS 1985



100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

SHEET 7 OF 11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

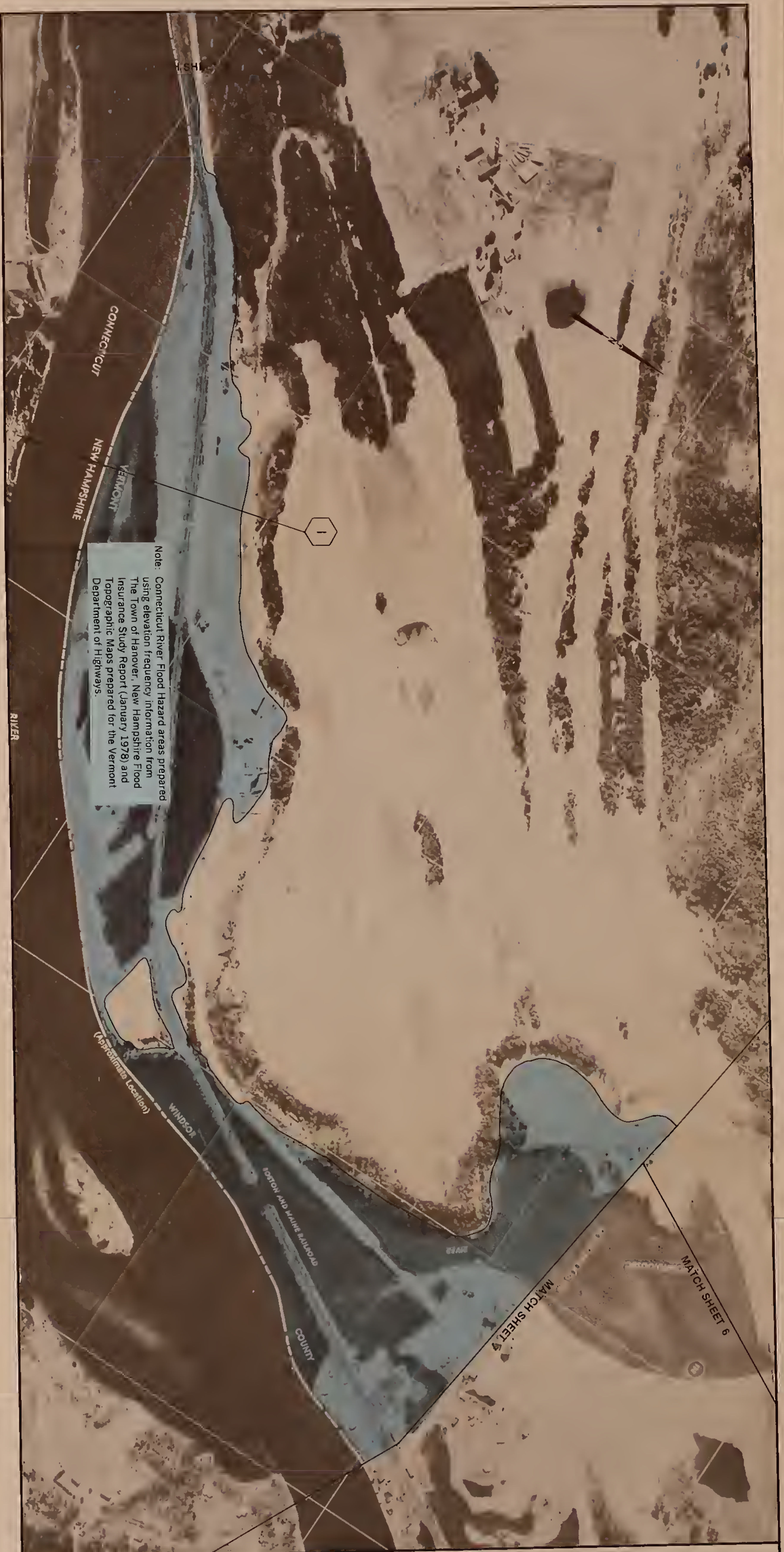
NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

CONNECTICUT RIVER

FEBRUARY 1985 4-P-30669

USDA-SCS-FORT WORTH, TEXAS 1985



100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

SHEET 8 OF 11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

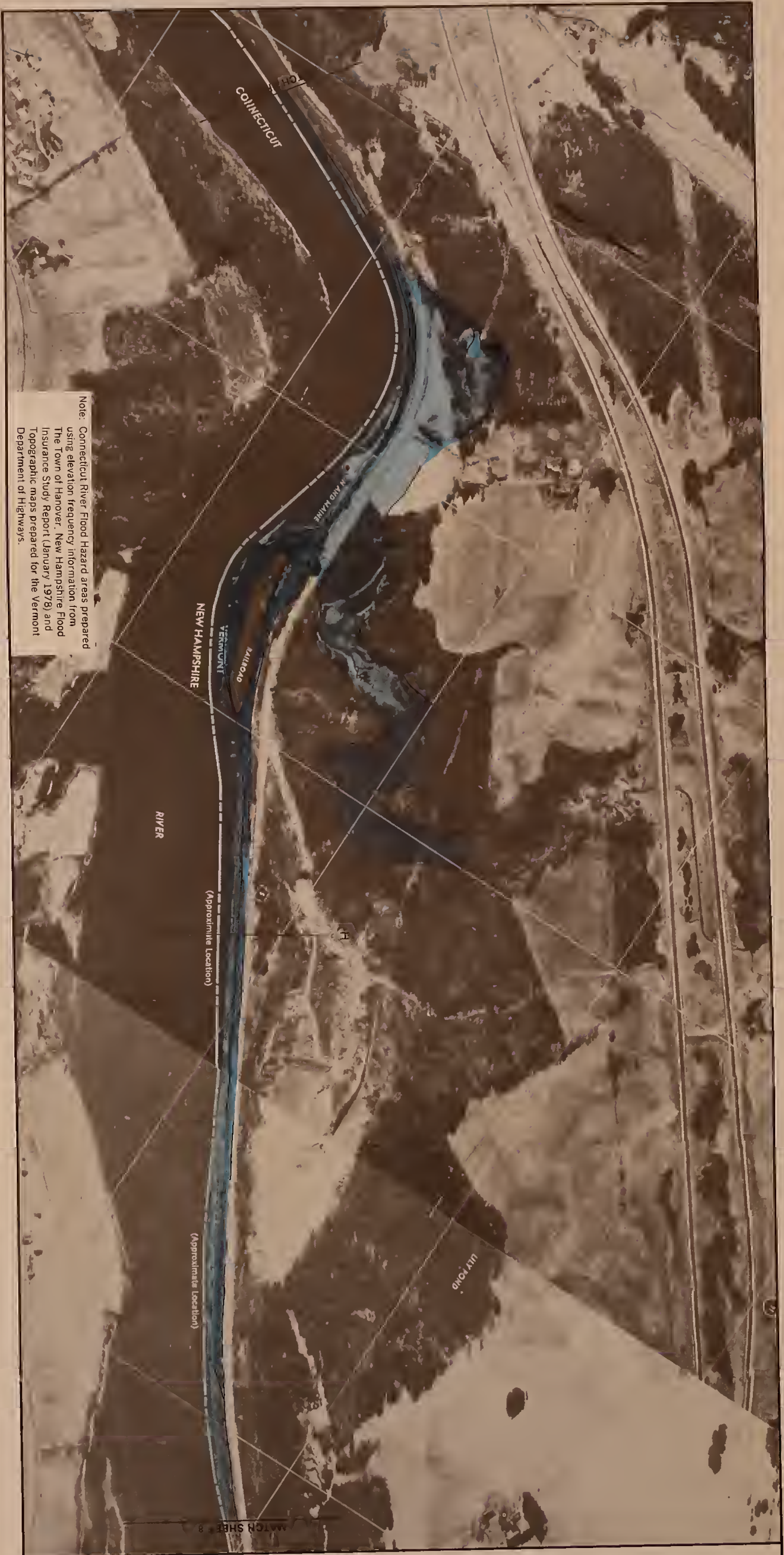
NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

CONNECTICUT RIVER

FEBRUARY 1985 4-R-39069

USDA SCS FORT WORTH TEXAS 1985



100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

BM11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

SHEET 9 OF 11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

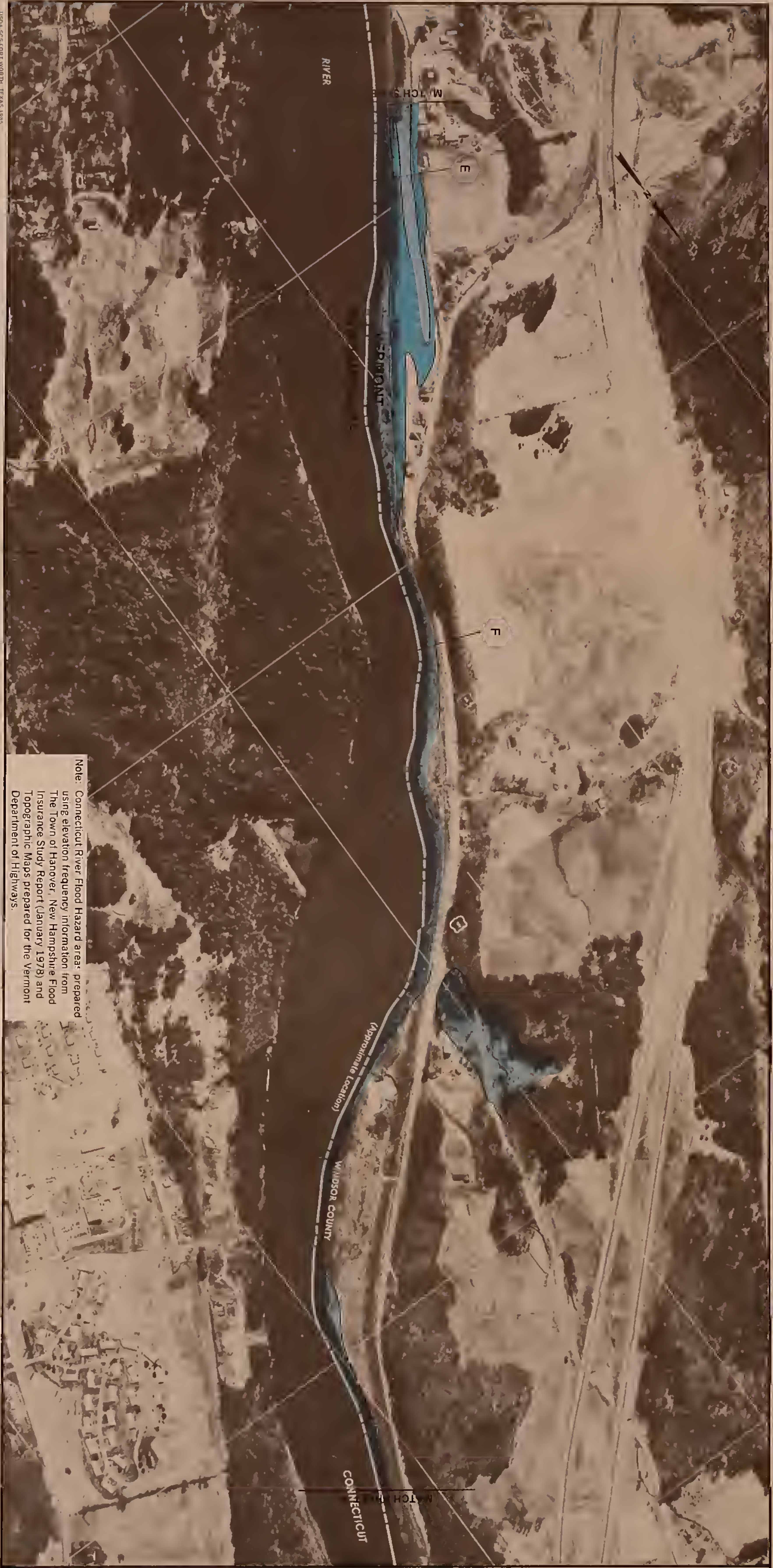
NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

CONNECTICUT RIVER

FEBRUARY 1985 4-R-39069

USDA-SCS-FORT WORTH, TEXAS 1985



100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

SHEET 10 OF 11

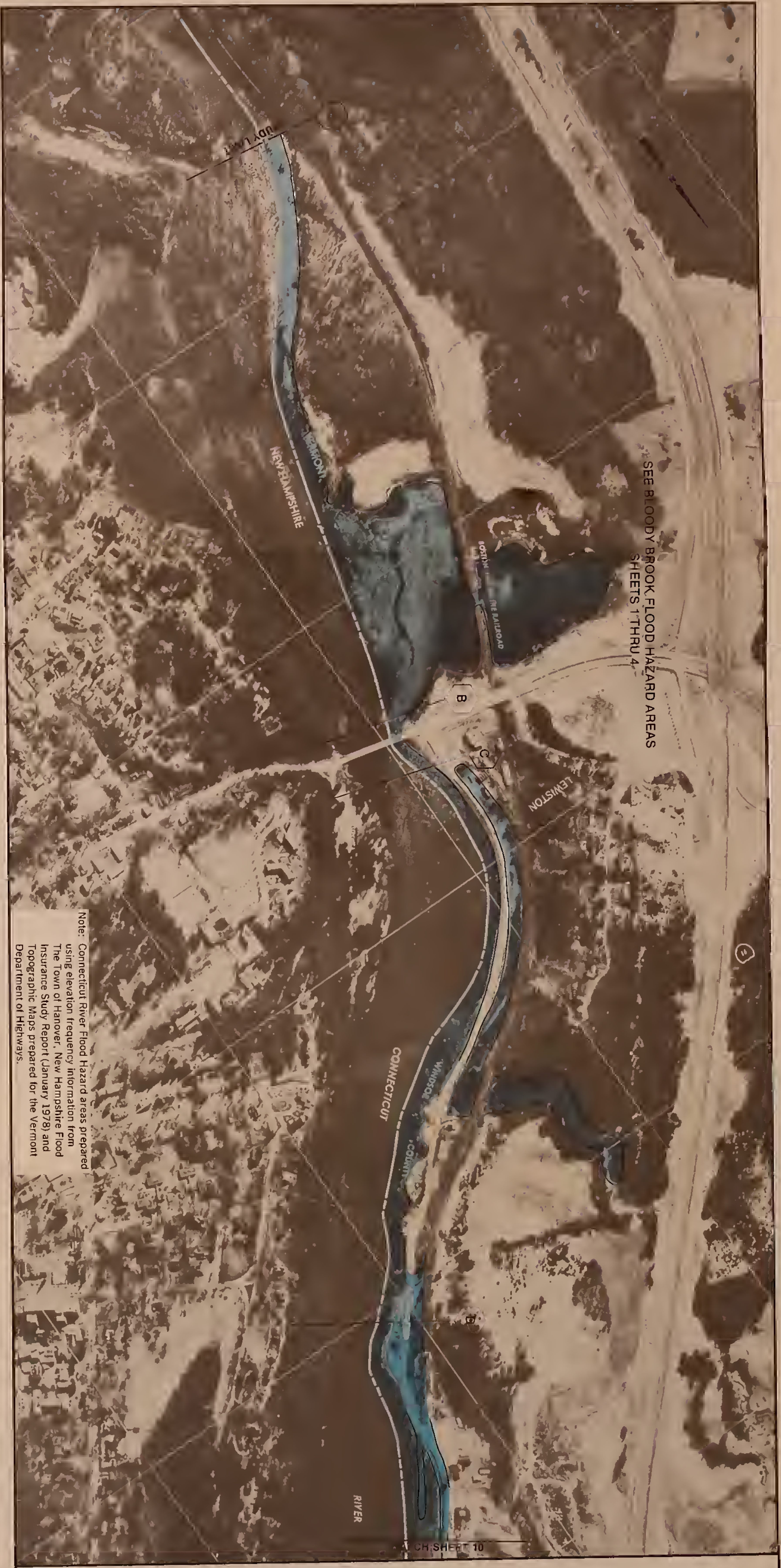
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

CONNECTICUT RIVER

FEBRUARY 1985 4-R-39069



USDA SCS FORT WORTH, TEXAS 1985

100 Year Flood Area
500 Year Flood Area
Surveyed Cross Section
Stream Channel

BM 11 Bench Mark

Note: Flood Boundaries shown may vary from actual ground location. See narrative for use of data.

500 0 500 FEET
100 0 100 200 METERS
APPROXIMATE SCALES
SPRING 1974 PHOTOGRAPHY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORWICH FLOOD PLAIN MANAGEMENT STUDY
ORANGE AND WINDSOR COUNTIES, VT.

FLOOD HAZARD AREA

CONNECTICUT RIVER

SHEET 11 OF 11

FEBRUARY 1985 4-R-39069

TABULATIONS OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurence of once in:			
		10 years	50 years	100 years	500 years
Stream	Cross Section	(National Geodetic Vertical Datum of 1929)			
Bloody Brook	BL1	828.8	830.8	831.0	831.6
	BL2	828.3	829.9	830.2	830.6
	BL3	822.7	824.0	824.4	825.5
	BL4	794.9	795.6	795.8	796.2
	BL4A	757.8	758.8	759.1	759.7
	BL5	720.6	721.3	721.7	722.7
	BL6	720.4	721.0	721.3	722.3
	BL7	715.4	716.6	717.0	717.9
	BL8	699.4	700.7	701.1	702.0
	BL9	698.2	699.4	699.8	700.9
	BL10	693.6	695.2	695.7	696.7
	BL11	680.0	681.8	682.2	683.5
	BL12	632.8	634.8	634.9	636.7
	BL13	631.9	634.4	634.4	634.4
	BL14	628.1	629.9	630.2	631.2
	BL14B	621.4	624.9	625.4	626.6
	BL15	621.4	624.9	625.4	626.6
	BL16	617.6	618.8	619.1	619.7
	BL17	598.0	598.9	599.3	600.1
	BL18	595.1	596.0	596.6	597.8
	BL19	588.7	589.9	590.2	591.2
	BL20	556.7	557.9	558.2	559.0
	BL21	556.6	557.9	558.2	559.1

TABULATIONS OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurence of once in:			
		10 years	50 years	100 years	500 years
		(National Geodetic Vertical Datum of 1929)			
Stream	Cross Section				
Bloody Brook (cont'd)	BL22	552.4	553.9	554.2	555.0
	BL23	537.0	538.0	538.2	538.7
	BL24	517.1	517.7	518.0	518.4
	BL25	516.9	517.5	517.7	518.2
	BL26	514.2	514.8	515.0	515.5
	BL27	491.9	495.4	496.3	498.1
	BL28	491.3	495.1	496.0	497.9
	BL29	487.0	489.4	490.0	491.2
	BL30	465.1	468.7	469.8	472.9
	BL31	461.3	464.3	465.1	467.4
New Boston Brook	NB1	735.6	736.3	736.5	736.9
	NB2	731.3	732.5	732.8	733.4
	NB3	731.3	732.5	732.8	733.4
	NB4	727.1	728.0	728.4	729.0

TABULATIONS OF WATER SURFACE ELEVATIONS

Location		Estimated elevation of floods with frequency of occurence of once in:			
Stream	Cross Section	10 years	50 years	100 years	500 years
		(National Geodetic Vertical Datum of 1929)			
Ompompanoosuc River	OM1	415.3	415.7	415.8	416.1
	OM2	413.2	413.5	413.6	413.9
	OM3	413.1	413.4	413.5	413.7
	OM4	413.0	413.3	413.4	413.7
	OM5	410.7	411.1	411.1	411.4
	OM6	404.1	404.6	404.8	405.5
	OM7	400.8	401.5	402.1	403.5
	OM8	395.0	396.7	398.3	401.3
	OM9	392.2	395.4	397.6	401.1
	OM10	390.7	395.1	397.6	401.0
	OM11	390.1	395.1	397.5	401.0
	OM12	390.1	395.1	397.5	401.0
	OM13	390.0	395.0	397.5	401.0

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM B-3	Approximately 0.6 mile north of BM 622, on Turnpike Road, on the southwest abutment of the concrete bridge, a chiseled square. Elevation 701.51
SCS-TBM B-4	Approximately 1.8 miles north of BM 622, on Turnpike Road, on the southeast abutment of the concrete bridge over Bloody Brook, a chiseled square. Elevation 722.43
SCS-TBM B-5	Approximately 1.1 miles north of BM 622, on the top of a concrete headwall for a 24 inch culvert under Turnpike Road, a chiseled square. Elevation 757.90
SCS-TBM B-6	Approximately 1.5 miles north of BM 622, on the stone headwall for the culvert under Turnpike Road, a chiseled square. Elevation 814.38
SCS-TBM 7	Approximately 1.7 miles north of BM 622, on Turnpike Road, on the upstream cement headwall of the 12 foot culvert for Bloody Brook, a chiseled square. Elevation 830.32
SCS-TBM B-1	Approximately 0.1 mile north of BM 622, on Turnpike Road, on the southeast abutment of the concrete bridge over Bloody Brook, a chiseled square. Elevation 634.21
SCS-TBM B-2	Approximately 0.25 mile north of BM 622, on the stone headwall for the culvert under Turnpike Road, a chiseled square. Elevation 652.43
USGS-BM 622	Approximately 1.3 miles north of Norwich, on New Boston Road, on the southeast abutment of the bridge over Bloody Brook, just upstream from the confluence with New Boston Brook, a chiseled square. Elevation 622.36
SCS-TBM 10	At the crossroad between New Boston Road and Beaver Meadow Road approximately 0.9 mile north of the Aldrich house, on the southeast abutment of the bridge over Bloody Brook, a chiseled square. Elevation 558.51

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM 11	Approximately 1.3 miles north of the Aldrich house, on New Boston Road, on the southwest abutment of the bridge over Bloody Brook, a chiseled square. Elevation 597.05
USGS-BM 536	U.S. Geological disc on the side of the Aldrich house in Norwich, VT. Elevation 536.61
SCS-TBM B-8	Approximately 0.25 mile west of the Aldrich house, on Beaver Meadow Road, on the southeast abutment of the bridge over Bloody Brook, a chiseled square. Elevation 520.99
SCS-TBM B-9	Approximately 0.6 mile north of the Aldrich house, on Beaver Meadow Road, at the high point on a ledge outcrop, a chiseled and painted mark. Elevation 552.41
SCS-TBM B-12	Approximately 0.3 mile west of the Aldrich house, on Hopson Road, on the southwest abutment of the bridge over Bloody Brook, a chiseled square. Elevation 494.79
SCS-TBM B-13	Approximately 0.4 mile south and west of the Aldrich house, on Elm Street, on the southeast abutment of the concrete and steel bridge over Bloody Brook, a chiseled square. Elevation 481.69
USGS-BM JB-4	U.S. Geological Survey disc, approximately 1.0 mile north from intersection of New Boston Road and Turnpike Road, on New Boston Road. Elevation 812.21
SCS-TBM NB-1	Approximately 1.2 miles north of the intersection of Turnpike Road and New Boston Road; and 0.2 mile north of BM JB-4 on the east side of New Boston Road; a railroad spike in the bottom of a 12" ash tree. Elevation 851.27
SCS-TBM NB-2	Approximately 0.6 mile north of BM 622, on New Boston Road, on upstream abutment of bridge over New Boston Brook, a chiseled square. Elevation 729.95
SCS-TBM O-7	On Route 132 at mile marker 1320-1411-0100, on south side of road, on the southeast corner, a chiseled square. Elevation 473.62

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM O-8	On Route 132, 150 feet east of MM 1320-1411-0080 in a 24 inch gnarled yellow birch tree, on the south side of the road, a railroad spike. Elevation 476.31
SCS-TBM O-9	Approximately 1.0 mile south of covered bridge in Union Village, on west side of Route 132, and 200 feet north of intersection of road to Norwich, on center of headwall of culvert, a chiseled square. Elevation 477.13
SCS-TBM O-10	Approximately 0.6 mile south of covered bridge on the west side of Route 132, opposite Tel. Pole #87, a nail in a 3.5 foot elm tree. Elevation 466.43
SCS-TBM O-11	Approximately 0.5 mile south of covered bridge on west side of Route 132, west of grass triangle at intersection of Union Village Road, on top of north wall of drop inlet, a chiseled square. Elevation 440.67
USGS-TBM 13	100 feet upstream from covered bridge at Union Village and 17.5 feet from corner building, a U.S. Geological Survey Marker in a 9 inch square concrete post. Elevation 417.56
SCS-TBM O-1	On Route 132, 0.9 mile west of Pompanoosuc Railroad Station, on the southeast wingwall of the bridge over the Ompompanoosuc River, a chiseled square. Elevation 399.08
SCS-TBM O-2	Approximately 0.4 mile north of TBM O-1, on a gravel road along the north side of the Ompompanoosuc River, on the east wall of a culvert a chiseled square. Elevation 390.94
SCS-TBM O-3	Approximately 0.2 mile west of TBM O-1, on the north side of Route 132, between GMP poles 43 and 44 an SCS aluminum disk and nail in a 30 inch white pine. Elevation 415.96
SCS-TBM O-4	On Route 132, 0.4 mile TBM O-1 on northeast concrete headwall, a chiseled square. Elevation 403.79

Tabulation of Elevation Reference Marks

Number	Description and Elevation (NGVD)
SCS-TBM O-5	On Route 132, 0.5 miles from TBM O-1, near mile marker 1320-1411-0140 in Green Mountain Power Company pole 61 a spike in a bottle cap. Elevation 408.55
SCS-TBM O-6	On the north side of Route 132, 0.6 mile west of TBM O-1, near an old barn, an SCS aluminum disk and nail in a large elm. Elevation 418.52

Investigations and Analysis

Approximately 8 miles of differential levels to establish vertical control and 48 cross sections were surveyed for this study. Surveys are referenced to National Geodetic Vertical Datum (NGVD) of 1929. Reference mark Descriptions and Elevations are listed in preceding tables and located on appropriate photomaps.

Flood runoff volumes and flow rates were developed along Bloody Brook and its tributaries using the SCS computer model described in Technical Release No. 20 (Reference No. 8). Flow-frequency values from this hydrologic model were adjusted as necessary in analyzing them along with values from similar gaged watersheds. Flood plain geometry and hydraulic characteristics were acquired by field surveys along their tributaries to the Connecticut River. Flood frequency surfaces were computed using the adjusted flows from the hydrologic model as inputs to water surface profile development, using the Soil Conservation Service's Technical Release No. 61 (Reference No.9). Results were checked against known high water marks at selected locations. The products of these analysis are the basis for much of the boundary elevation and profile information contained in this report. This report's information reflects coordination with evaluations made by others along the Connecticut River and the Ompompanoosuc River.

The flood stages provided for selected storm frequencies should be considered as minimum elevations for the prescribed uses of this report. Certain indeterminate factors and conditions affecting future flood flows could cause higher flood stages than indicated. These include ice and debris, clogging of bridges and culverts, sediment, ice and debris jams along the channel and flood plain, and changes in the vegetative character of the channels and flood plain.

Analysis of the hydraulic characteristics of streams were carried out using the SCS computer program WSP-2 (Ref. 9). Cross section data for the streams and structural geometry of bridges and culverts were obtained by transit surveys. From stage-discharge curves, elevations and flood boundaries could be determined at the cross sections. Straight line interpolations of the elevations were used for flood profiles between cross sections. Flood boundaries between cross sections were drawn on the photomaps using USGS topographic maps and aerial photos as a guide. The results were reviewed with state and town officials to eliminate any obvious errors.

The photomaps were assembled as strips from spring 1974, 1:5000 scale, Vermont Mapping Program, Orthophoto Maps by the USDA-SCS Fort Worth, Texas Cartographic Unit.

Steps that can be taken by Individuals during a flood:

This flood plain management study is an aid to persons living in flood prone areas. If your home is within the flood plain, the following information should serve as a guide for dealing with floods.

Being well informed is your best protection. It is extremely important to know where to go in the event of a flood. Remember that roads are often built in valleys where floodwaters will most likely go. You should reach higher ground, and it may be easier and safer to do this on foot, rather than by car.

The major causes of floods are melting snows and rainfall. Listen to weather reports and be aware of the chance of flooding. Never ignore a flood warning. Listen for emergency instructions and follow instructions given.

If it is necessary for you to evacuate your home, do so quickly and cautiously. Follow evacuation instructions that are given. Do not try to take all of your belongings with you. Take necessary personal items such as eyeglasses or medicines, flashlights, a small supply of canned food, a can opener, and several blankets.

If you are traveling by car you may encounter these hazards:

washed-out road or bridge
undermined roadway
landslides
fallen rocks
downed powerlines
floating debris

Watch for these hazards carefully.

If it is not necessary to evacuate your home, there are precautions you should proceed with.

Fill large containers with water and after doing so shut off the main water valve to protect the clean water already in your water system. Be certain to shut off your water heater since no water will be going to it.

As long as electric service is available it may be used safely unless the main circuits are flooded. In such a case you will reduce the risk of electrical shock and short circuits if you turn the power off. Do not touch the switch if you are wet or standing in water. Unless you detect a gas leak, you may continue to use gas systems.

Be aware that floods often produce fire hazards. Watch for broken or leaking gas or oil lines, flooded electrical circuits, flooded furnaces and other appliances, and inflammable or explosive materials which may come from upstream.

Anchor or move inside any belongings such as trash cans, toys, lawnmowers, etc. They may become hazards to people downstream if they are washed away.

Move livestock to high, open ground and if possible keep them from drinking flood water or eating feed soaked with flood water.

The following items could help improve your chances of survival if a flood occurs:

- portable radio and spare batteries
- first aid kit
- flashlights and spare batteries
- foods which require little or no cooking and no refrigeration
- blankets
- rope
- hand tools
- drinking water

Precautions taken to reduce losses from flooding are called floodproofing.

The basement walls of your home are probably not built to withstand the additional pressures of water-soaked soils. You will have less damage if you allow flood waters to come in. When you receive a flood warning, remove articles from basement and open a basement window. Fuse boxes and other equipment should not be located in the basement.

Floodproofing for homes with adequately reinforced basement walls could include: sealing cracks in walls and floors with hydraulic cement, installation of a sump pump with a reliable power source, placing heavy screens over windows to prevent breakage from floating objects, and placing valves on main drain lines to prevent backup of water.

It is important to remember that floodproofing can help reduce damages, it does not make it safe to remain in your home during a flood.

After a flood, reenter buildings with caution. Watch for fire hazards and falling debris. Do not use appliances until they have been checked for damage. Do not use any food or water which may be contaminated.

Normal home insurance does not cover flooding. Ask your insurance agent about federally subsidized flood insurance. Not all agents handle flood insurance and you may have to contact several of them.

Many people are hurt or killed during or after a flood by their own carelessness. Know before hand what to do if a flood occurs. Your local Civil Defense Agency can help you with any questions you may have.